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A VESSEL OWNERS' MARKET.

RETURN OF FREIGHT RATES WHICH IT WAS THOUGHT WOULD NEVER AGAIN BE HEARD OF IN THE LAKE TRADE—SPECULATION AS TO NEXT YEAR.

The lake freight market is a vessel owners' market for the balance of the season. There is now no difference of opinion on this score. Predictions as to how high rates will go are worthless, but it would seem that there is every reason to expect an advancing market up to the closing days of navigation in view of the action of the ore interests during the past ten days. Last week not more than three or four charters were made for immediate loading of grain out of Duluth, and yet the rate was advanced to 3½ cents for "spot" vessels, and one ore concern paid $1.50 for a steamer to make six trips with ore from the head of Lake Superior. It is said that this particular ore house, shipping probably 3,000,000 tons in a season, had not secured up to the first of August more than 20,000 of "wild" vessel capacity. The great bulk of its ore had, of course, been covered by freight contracts running over the greater part of the season, but the general demand for vessels not tied up by contracts resulfed in a different situation as to the ore that was uncovered. Chicago grain shippers have claimed that if it were not for the unprecedented demand for vessels in the ore and coal trades, the shipments of grain during the past month would not have warranted payment of more than a cent a bushel out of Chicago, but as noted above the ore interests have been actually bidding against themselves, in order to keep their product steadily moving in advance of the grain crop that promises a big business for the fall. As a result of this condition, ore rates are up to $1.25 from the head of Lake Superior, $1.10 from Marquette and 90 cents from Escanaba, figures which it was thought would never return again in the lake trade, and yet there is no more surplus of vessels than there was in the first days of the season when the leading ore rate was down to a 60-cent basis.

Vessel men are indulging in some speculation regarding business for next season. With pig iron sold well into next year at prices that would warrant the payment of high lake freights, rather than chances being taken on a repetition of this season's experience in transportation matters, the ship owners are of the opinion that there will be a call very early for the use of their property, and some of them think that advances made to the ore interests even now might result in contracts being closed at a dollar a ton on ore. Their ideas of the market for next year are based on nothing less than the dollar figure, but there is, of course, nothing tangible as yet on this score. It is reasonable to expect, however, that contracts for 1900 will be closed up much earlier than in past years.

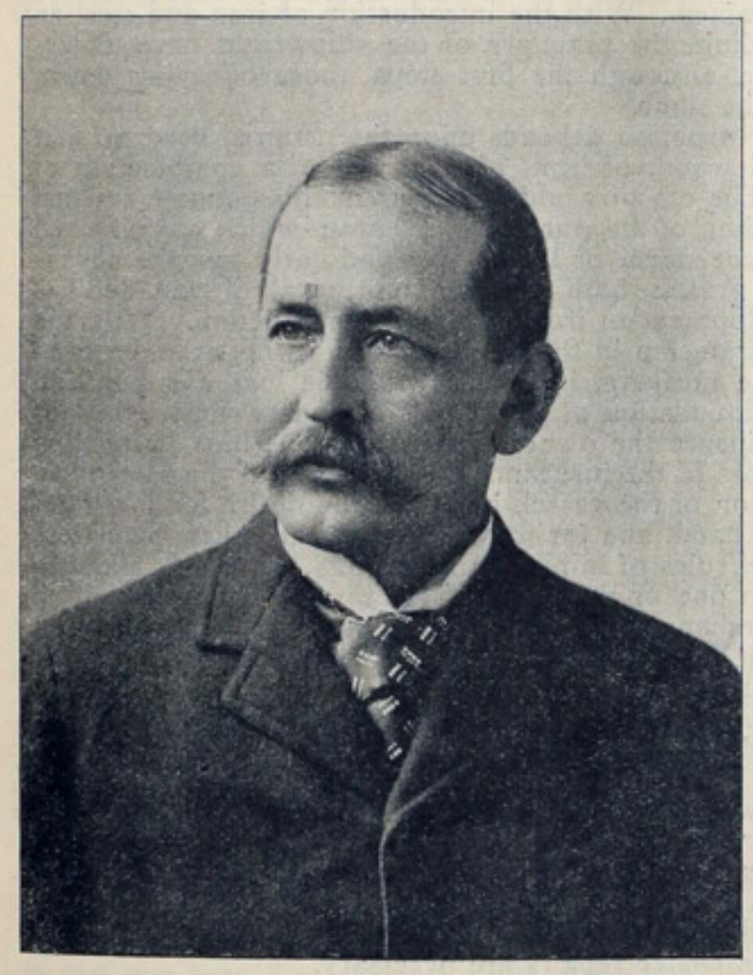
The few coal shippers who covered Lake Superior sales at 30-cent lake freight contracts certainly have reason to congratulate themselves. There was probably 600,000 tons in all covered at the opening of navigation at this rate. Practically the entire output to Lake Superior could have been covered at the same figure if the shippers had started in early enough, but when they were willing to pay the 30-cent contract rate it was too late. Now they are called upon to follow the repeated advances in ore and grain, and the Lake Michigan coal rate has reached 80 cents, with vessels going light to Lake Superior rather than accept anything less than 60 cents to Duluth, Superior and other ports at the head of that lake. These marked advances are certainly a great hardship in the coal trade, especially with shippers who sold coal delivered, but as with other commodities, it would seem that the season is now so far advanced and coal shipments so much short of requirements, that advancing rates must be expected up to the last days of navigation.

ANOTHER IMPORTANT CHARTER.

W. C. Richardson of Cleveland has chartered for the balance of the present season from Capt. James Davidson of West Bay City the steamer Amazonas and consort Armenia and from Capt. J. W. Millen of Detroit the steamer Iron King and consort Iron Queen. The charter is made in the interest of one of the large iron concerns of Cleveland, but the vessels will be managed in the office of W. C. Richardson. The consideration has not been made public. The vessels chartered from Capt. Davidson are among the largest of the wooden craft turned out from his ship yard of late. They will each carry 3,500 gross tons. The Iron King and Iron Queen will carry 2200 and 2500 tons respectively, so that the tonnage as a whole will be quite a help to the iron concern securing it.

ALABAMA NEARLY READY.

It is more than probable that the battleship Alabama, now nearing completion at the yard of the Wm. Cramp & Sons Co., Philadelphia, will depart on her trial trip early in September. The vessel's conning tower is in place and all the side armor is on with the exception of one or two plates, which have not yet been received. The turret plates, also, are yet to be delivered but the machinery has been completed. The contract time for delivery of this vessel is Oct. 2, so that it is quite certain she will be in the government's hands by that date, even though the official trial, which cannot take place until all the armor is in position, is deferred until the main battery is installed. None of the armament has yet arrived. At the same time the uncertainty as to delivery of material, now so generally complained of, may necessitate a delay long beyond the time anticipated. The Alabama is to develop 10,000 indicated horse power and a speed of 16 knots. The contract price for hull and machinery is $2,650,000.



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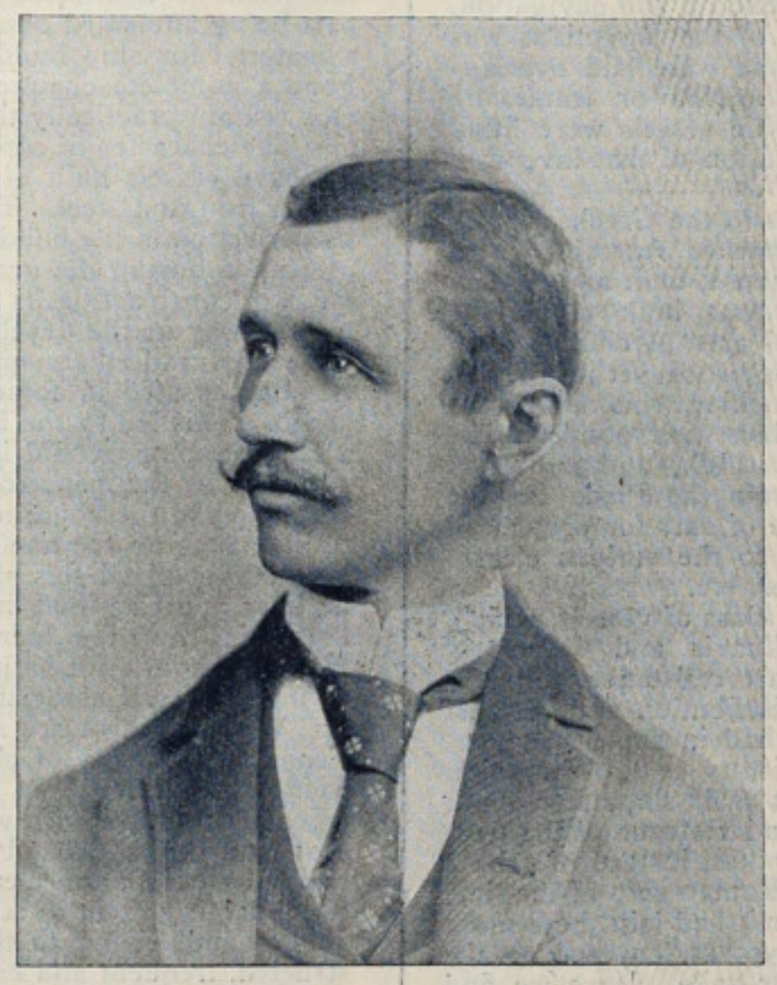


T. F. NEWMAN, President.

W. A. COLLIER, General Manager.

PROBABLE HEADS OF THE GREAT LAKES TOWING CO.—CONSOLIDATED TUG LINES.

WORLD'S FLEET OF TANK STEAMERS.

The Standard Oil Co.'s tank steamer Atlas, recently completed at the Roach yard, Chester, Pa., and which was some time ago described and illustrated in the Review, is now the only tank steamer flying the American flag. The burning of the Standard steamer Maverick leaves the Atlas alone as an American representative of this type of vessel. Tank vessels have been in service now for about ten years and statistics show that, aside from the new ones launched this year, there are afloat under all flags 169 of these vessels, aggregating 381,478 tons, of which 155 are steamers of 367,910 tons. The fleet has been built practically since 1888, when vessels of 42,042 tons were afloat. In 1893 the large tonnage of 94,568 was turned out, and another remarkable year for building tankers was 1894, when the total tonnage was 34,721. Of the 169 vessels, fourteen have a capacity of over 4000 tons. The largest tanker now afloat is the British steamer Tuscarora, owned by the Standard Oil Co., her gross tonnage being 6117 tons. A tank steamer of 10,000 tons is now being built on the Tyne, and others nearly as large are under way.

BUILDING A SHIP.

A SUMMARY OF THE PROGRESS THAT HAS BEEN MADE SINCE THE ART OF NAVIGATION FIRST OCCUPIED THE MINDS OF MEN DWELLING NEAR THE GREAT SEAS—DETAILS OF MODERN PRACTICE IN THE CONSTRUCTION OF BOTH STEEL AND WOODEN VESSELS.

*BY REAR ADMIRAL HICHBORN, CHIEF CONSTRUCTOR, U S. N.

It is impossible to state with any degree of accuracy the time or the portion of the globe in which ship building originated. Among razor knives found in Denmark, belonging to the "bronze" age in Europe, are several with representations thereon of galleys, which compare favorably with those of ancient Rome, and show that the spirit of enterprise and adventure inherent in human nature led men of this early age to devise means of navigating the bodies of water near which they had their homes. The art of navigation was doubtless one of the first to occupy the minds of men dwelling near the shores of the great seas. The ark of Noah is the first vessel of which we have any record. It was 450 feet long, 75 feet in breadth and 45 feet deep. The proportions of length, breadth and depth are noticeable from the fact that the same ratios are now considered to be excellent for combining great strength of structure with large carrying capacity. The Phoenicians were the greatest commercial people of ancient history, and, instructed by the Egyptians, seem to have been the first to make material progress in the construction of vessels. In the tomb of Rameses the Great is a representation of a naval combat between the Egyptians and a people, supposed to be Phoenicians, whose ships are propelled by sails. A biblical reference to the power of Tyre, capital of Phoenicia, describes its vessels and their construction, the planking being made of the fir trees of Senir, the masts of cedars of Lebanon, the oars of the oaks of Bashan, the rowing benches of ivory and the sails of fine linen of Egypt. Reference is also made of mariners, pilots, caulkers and men-of-war, showing the progress made in the arts of ship building and navigation. A peculiar feature in the construction of the ships of the Egyptians was the planking, which were about three feet square and were laid overlapping, like shingles upon a roof, being fastened to the ribs or frames by wooden tree nails. According to Herodotus the Nile vessels were fitted with rudders at the stern, thus antedating the application of that invention to sea-going vessels by several centuries.

The vessels of the Phoenicians served as models to the Greeks, whose ships, at the height of their civilization, show a marked resemblance to those of the dwellers in Tyre. Heiro, King of Syracuse, built and sent to Ptolemy II. a ship of surpassing magnificence. It was built under the superintendence of that great master of mechanical arts, Archimedes, of whose ingenuity and mechanical skill we have ample proof, yet it is stated that his ingenuity was taxed to the utmost in launching this enormous vessel. It is said to have contained gardens, stables, fish ponds, mills, baths and an engine to throw stones 300 pounds in weight, and arrows 12 yards long. The floors were inlaid with scenes from the Iliad. As the vessels of this period depended mainly upon the use of oars for propelling power, their arrangements gave distinctive names to the various classes of vessels, such as Biremes, Triremes, Quadriremes, etc.

The nations of the north of Europe developed a class of vessels, which, from specimens found buried in mounds in Scandinavia and Denmark, show a remarkable knowledge of the forms of least resistance, together with the strength of materials and their proper distribution and suggest that the influence of the Phoenician ship builders had in some way penetrated to the north of Europe. Caesar, in his history of the campaign against the Veneti, in the year 54 B. C., states that their ships were built entirely of oak, and designed to endure the force and violence of the tempests; the rowers' benches were fastened by iron spikes, instead of cables, they secured their anchors with chains of iron. A Roman ship of the time of Trajan, sunk in the lake Ricciola, was raised after it had lain there more than 1,300 years; the planking was of pine and cypress, covered on the outer side with sheets of lead fastened with copper nails. Here we find metal sheathing and chain cables in use at the beginning of the Christian era.

SHIPS OF THE GREEKS AND ROMANS.

The Greeks and Romans had a peculiar method of girding their vessels with long hempen cables, which, passing through holes at the stern post, continued all around the vessel, fore and aft, immediately under the wales; also the hulls were undergirded transversely in the same manner as the vessel that was wrecked in carrying Paul to Rome. The ropes were tightened by levers, and by shrinking when wet drew the members of the vessel closely together after the fashion of the hoops upon a barrel. The hulls were thus strengthened to resist the violence of heavy seas and for ramming. The sailing vessels of the early Roman empire, such as the one that bore Paul to Rome, and those engaged in the corn trade with Egypt, were the direct precursors of the large sailing vessels which superceded the galleys propelled by oars. But little is known of the ship building of the middle ages.

In the fifteenth century the Spaniards and French made great progress in the art of ship building, the French being the first to apply the principles of mathematics to the design and construction of vessels. The English availed themselves of the researches of the French, and, adopting the forms of the French vessels captured by them, soon began to acquire renown as builders of fast and powerful vessels.

The great forests of America enabled Americans to take the lead in the production of vessels at small cost. For many years the models and methods of the English and French were followed, but the impetus given by the fitting out of privateers during the latter part of the seventeenth and the beginning of the eighteenth centuries did much to create a new era in American ship building. As has been well stated "there was assembled here in New York, between the year 1685 and the year 1700, such a swarm of fighting sailormen, and such strong stimulus was given to the marine industries of ship building, rope making and the putting up of sea stores, that only a few cities in Europe could compare in completeness of equipment with New York."

*Prepared for *Sunday Herald*, Boston.

CLIPPER SHIPS OF AMERICA.

In 1850 the American ship builders cut loose from the trammels of precedence and brought out the clipper ships, which, owing to their remarkable performances, soon influenced the naval architecture of foreign nations and made a lasting impress upon the models of the navies of the world. One of this class, the Red Jacket of New York, made the trip from Sandy Hook to Melbourne, 12,720 miles, in 69 days and 11 hours; another, the Sovereign of the Seas, of Boston, sailed 5,391 miles in 22 days. The ship Great Republic was the largest of this class of vessels; she was 325 feet long, 53 feet wide and 37 feet deep, with a capacity of 4,000 tons. She had four masts, the main yard being 120 feet long; a suit of her sails contained 15,653 square yards of canvas, or sufficient to cover about 3¼ acres of land. So fleet were these vessels that for long distances, especially where the trade winds could be utilized, they were scarcely inferior to vessels propelled by steam, and so were enabled to carry a large amount of the world's trade long after steam vessels were successfully introduced.

A great change took place in the art of ship building when the steam engine was applied to ships. "The old proportions and forms so well suited for the speed of sailing ships and the forces impressed upon them, were ill adapted for propulsion by the paddle wheel and still more so for propulsion by the screw." The investigations of science with regard to the strength of material, the forms of least resistance and the character of the stresses and strains brought upon ships from the action of wind and wave have brought the art of ship building to almost an exact science, and robbed the old masters of ship design of that air of mystery and reverence which surrounded them even in our own memory. Formerly the successful designer of ships had a store of practical experience upon which he based his successful practice; his eye was educated to know the proper proportion of all the parts, and many were anxious to sit at the feet of the successful builder in order to obtain the secrets he was supposed to possess, for experience was the only teacher in those days. The naval architect was then compelled to begin life as a practical shipwright and acquire the theory as opportunity offered. Now it is possible to obtain in the scientific institutions a thorough theoretical education, the practical part being afterward obtained. With the introduction of iron and steel as a material for ship building, the practices of the shipwright have undergone a complete change, although the first steps, those of laying down, etc., remain practically the same.

The character of construction depends upon the material used, so that we have vessels built of wood, of iron, of steel and of a combination of wood, iron and steel. The era of wooden vessels in this country reached its perfection in the building of the war vessel Trenton, which was wrecked at Samoa during the great storm of 1889. England early saw the advantages of constructing its vessels, both merchant and naval, of iron, and has led the way in the development of iron and steel construction. With the growth of trade there sprang up in the minds of ship owners the desire to be compensated in some measure, in case of possible loss, for ship and cargo. This led to the foundation of companies of underwriters, who, for a consideration, would insure the owners against loss. Ships were first surveyed by the inspectors of the insurance companies, and the rates fixed according to the condition of the vessel, but from the desire for low rates of insurance on the one hand, and for good risks on the other there were gradually evolved sets of rules of minimum scantlings for vessels about to be built and classified in one or the other of the insurance companies, so that today very few merchant vessels are built in the United States or in Europe that are not built according to the rules of some one of the Lloyds or underwriters' associations.

Wooden ships are so called because built almost entirely of wood. From the difficulty of obtaining the necessary strength without excessive weight they have been confined to moderate dimensions. Their advantages are the ease with which they can be constructed and consequent low cost, and the fact that below the water they can be covered with copper, which by exfoliation clears the bottoms of barnacles and marine growths, thus enabling them to remain afloat a long time without docking. On the other hand, owing to the nature of the material of which they are constructed, frequent and extensive repairs are necessary.

The introduction of iron and steel as a material for ship building made possible ships of almost any size, the only limit being the cost of production and maintenance and the size of existing docks. The difficulties experienced are deterioration from the action of salt water upon the metal, and the fact that barnacles and marine growths seem to claim the bottoms of iron and steel vessels as their own peculiar field for operation, especially in tropical waters, thereby retarding the speed to a marked degree and making necessary the frequent docking of vessels to clean and paint the bottoms. To obviate this trouble many medium sized vessels are built of iron or steel throughout, except the outer skin and deck plank, which is of wood. The bottom planking being of wood, is readily coppered, while the frame work and topsides being of metal, confines the repairs chiefly to the renewal of the planking. This style of construction is called "composite."

LAYING DOWN A SHIP IN THE LOFT.

The form of the vessel or the lines having been determined in the drawing room, the frames or ribs are next drawn full size upon the floor of a building known as the "mould loft," in order that moulds or scrive boards may be made to which each frame is shaped or bent. In order to facilitate the work in the loft, the ship is divided into two parts, called the fore and after bodies, being divided by an imaginary line amidships, or a point near which the curvature of the lines is reversed. On the bodies are laid off the edges of the plating, the line of the stringers and keelsons, the undersides of the decks, the outline of the floors, etc. For the wooden vessels the moulds represent the shape and taper of the frame timbers. Pieces of timber are then selected and worked exactly to the moulds, the joints or butts being carefully scarped together, and are also at the same time bevelled on the edges to conform to the bevel boards taken from the loft floor. For metal vessels the moulds are made to show the shape of the outer edge of the frame and the line of the floors; the object in thus moulding, shaping and bending the frames is to have them to their true shape, so that when put together they shall form the outlines of a vessel agreeing with the plan of the naval architect and giving, when the planking or plating is fastened to them, the complete outline of the hull. While this part of the work, or laying down, as it is termed, is going on in the

loft, the draughtsmen in the office are preparing the orders for the material and the shipwrights in the yard are preparing the foundation and laying the keel blocks upon which the vessel is to be built.

For convenience in ordering the material of an iron or steel vessel, an exact model of it is made in wood on a scale one-twenty-fourth or one-forty-eighth of full size. On this model are marked off the stations of the frames, the edges of the plating and stringers, and the plates laid off in their proper lengths, so as to have an acceptable shift of the butts or joints. The dimensions of the frames and plates are then measured from the model, and, after being verified as to width in the loft, are sent directly to the mills. An allowance is made for the machining of the plates, or such of them as form the outer strakes, for the inner strakes are often placed on the ship without planing the edges, the ends only being machined, in order to have close joints for calking metal to metal.

THE BUILDING OPERATIONS.

As the entire weight of the vessel must come upon the keel blocks, it is essential that they shall have a very firm foundation, such as piling or concrete. They generally slope lengthwise toward the water, and are placed about 4 feet apart from center to center. Each block is built up of several pieces of timber, the bottom pieces often of sufficient length to serve as a foundation upon which to build up the supports of the launching ways. The upper pieces are in some yards so put together as to be capable of being removed from under the keel without splitting; in others the removal of the blocks is effected by splitting out the cap pieces. The blocks are generally given an inclination sternwards of from five-eighths of an inch in heavy vessels to three-quarters of an inch in light ones to the foot, to facilitate launching. The first operation, be the ship of wood or metal, is to place the keel upon the blocks, and scarp or strap the pieces together; if the vessel is of metal the keel may be constructed after several methods. The bar keel consists of a plain bar, in suitable lengths, with scarped butts, the plating of the seaboard strakes being flanged, or turned down against the bars and riveted through and through. Another variety is the side-bar keel, which is built up of three parts, the middle piece extending above the keel proper to a depth equal at least to the floors; the garboard strakes are riveted through in a similar manner to the ordinary bar keel; this is one of the strongest of keels and also one of the most costly. Another variety, and one that, in these days of cellular or double-bottom construction, finds general acceptance, is the flat keel; this consists merely of a flat plate, bent to shape. If the keel laid is a bar keel, of either type, the garboard strakes are at once put in place to afford a landing for the frames. Afterward the stem and stern post are set up and, if the vessel is of wood, the deadwood and other pieces in the center line are bolted in place.

The stem of a metal vessel is usually a simple forging, rabetted to receive the ends of the plating; that is, a recess is cut in it on each side, so that the plates may end in it and form a fair and flush surface. The stern-post, if of a single screw vessel, is quite an elaborate forging, although of late years castings of steel have been substituted for forgings, with great success. The post is made up of two parts in one; first, the post proper, on which the plating ends, and through which the screw shaft passes, forming incidentally a part of the stern bearing; the other part is the rudder post, or the support of the rudder, the two connected forming a continuous frame about the propeller. In twin-screw vessels the stern frame is scarcely less elaborate, for provision is usually made for heeling the shaft brackets or struts which support the screws on the frame, which must also receive the ends of the hull plates and support the rudder.

In wooden ships the frame pieces, cut to the moulds, with their floors, are adjusted to the scores made in the deadwood to receive them, and are securely fastened. In iron vessels of the plainer class the frames and floors are often riveted up entire upon the ground, and then raised to their place upon the keel or garboard plates, but first the frames and floors must be bent to shape, and this is done as follows: The frames are usually of shape iron rolled in one length, either of angle bar, angle bulb, channel or Z bars. The long bars are placed in a furnace especially designed for this purpose, and heated until they can be readily bent to the shape of the mould, which has been marked off upon the bending slabs; the slabs are of cast iron from 3 to 4 inches thick, perforated with square holes closely set, and arranged so as to form a smooth floor of sufficient size to accommodate the largest frames and give room to the workmen. In the square holes, iron stops are placed agreeing in contour with the shape of the mould; the bars, after being heated, are forced back against the stops, and at the same time bevelled to conform to the bevels taken from the loft. After cooling the holes are punched for the rivets used in connecting the frames with the floors, skin plating, beams, etc.

FRAME WORK AND SIDES OF A SHIP.

The upper ends of the frames are held by crosspieces of wood called spalls. Each frame is adjusted so as to be exactly perpendicular to the keel and is held in place at the top by strips of timber called ribbands, which have been prepared from measurements taken from the loft, and the proper position of the frames marked thereon. The ribbands and frames are shored up to keep them in position until the inner strakes of plating are on. The main keelson is then placed upon the floors, directly over the keel; if of wood, it is fastened through floors and keel, but if of metal, is riveted to the floors, they in turn being riveted to outside plating. This keelson serves to keep the floors from tripping, and enters into the stress-resisting element of the vessel. A much better disposition of the material, on the same weight, is known as the cellular construction, or double-bottom system. On this system are constructed nearly all of the large and magnificent vessels engaged in the transatlantic trade and nearly all war vessels. The frames in the double bottom or the space between the inner and outer skins are made up of short frames and bracket plates, somewhat like the lattice work of bridge girders, between the keelsons, or longitudinals, so that the erection of the longitudinal and transverse framing must be carried on together; outside of and above the double bottom the raising of the frames is substantially the same as described above.

Before the planking is placed on the vessel, the sheer lines at side and the normal lines, or spilings, of the bottoms, are marked on the outside surface of the frames; the spilings are found by fastening a broad, flexible and straight edged batten to the frames in such a manner as to cross the midship frame at right angles, the batten itself will then assume a line at all points normal, or square, to the frames of the ship. These lines are laid off at intervals of from six to eight seams of planking. The plank are worked either in parallel strakes or in combination of two strakes with the alternate edges straight. This is sometimes called the "anchor stock method," the object being to have the narrowest portion of one strake always opposite the widest portion of the other. The butts of the plank are shifted so as to have at least three strakes between butts in the same frame space. The strakes next the keel, called the garboard strakes, and those at the heads of the frames are made thicker than the balance of the plank, in order to have the greater amount of material at the parts of the vessel where the greatest strains are experienced. Before the plank are placed in position the frames are often bound together or strapped diagonally by iron bands, 2½ to 3 inches wide; thus the frames are bound longitudinally by the planking and ceiling and diagonally by the braces. In metal vessels the plates forming the outside skin are worked in lengths from 12 to 20 feet, and in widths varying from 24 to 60 inches. Templates are constructed from the loft giving the exact size of the plates with the position of the rivet holes marked thereon; the plates are then planed to the required sizes and the rivet holes punched and countersunk, and are then ready to be put in place. The inside strakes are placed in position first and bolted up. Templates of the rivet holes in the edges are taken off for the outer strakes in order that the holes in the inside and outside strakes may exactly coincide for the riveting. The necessary holes for the stringers and keelsons are also punched at the same time. As the finished surface of the vessel beneath the water must be smooth and free from all protuberances, the rivets that pass through the plates are beaten down to a conical head to fit a corresponding recess made in the outer surface of the plate, which is called a countersink.

CONSTRUCTION OF DECKS, INNER BOTTOM, BULKHEADS, ETC.

The deck beams not only serve to carry the deck and its load, but are also struts and ties which prevent, in a certain measure, the ship's sides from collapsing; it is very necessary, therefore, that they shall have good connection with the frame and the outer skin. In wooden vessels the beams are built up; that is, composed of several pieces of timber securely scarped and bolted together. The beams rest upon clamps, or shelves, at their outer ends, which are thick pieces of plank running fore and aft on the inner side of the frames, and are securely fastened by means of vertical knees to the framing and planking. They are also braced in a longitudinal direction by smaller knees placed horizontally. The whole structure—beams, knees, clamps, frames and planking—are thoroughly bolted and doweled together, enabling the beam to act as an efficient strut or tie, as the strains are brought upon the vessel in pitching and rolling. In order to give the beams strength to resist deck loads, and at the same time throw the water to the sides where the waterways are located, they are slightly arched; the arch is called spring or round. The beams of metal vessels are usually formed of iron or steel rolled to shapes known as tee or angle bulb beams; they vary in weight and in depth from 4 to 15 inches. The lengths are taken from the plans and ordered in one piece for each beam, with the proper round or spring. The beam so ordered is slightly longer than the distance from side to side of the ship, to allow for turning down the lower half at the ends to form knees through which they are fastened to the frames. The method of framing the knee is to split the beam for a slight distance at each end, midway of its depth, and turn down the lower half upon a former; a piece of metal is then welded in to connect the upper and lower parts. After the beams are in position the spalls can be removed, leaving the space between decks free for the workmen. In framing the decks, the beams are arranged to allow of the boilers and machinery being lowered to their beds without disarrangement of the deck plating; provision is made also for the cargo hatches, mast partners and other openings.

In wooden vessels the ceiling, with the thick strakes and keelsons form a complete lining to the vessel worked on the inner side of the frames. In metal vessels the inner skin is more often called the inner bottom, and is worked only when the vessel is constructed on the cellular system. It is usually placed from 3 to 3½ feet from the outer skin to allow ready access for thorough inspection, cleaning and painting. It is worked on the upper side of the bracket frames very much in the same manner as the outside plating is put on. For structural purposes, the inner bottom enters largely as a factor of strength. Many freight vessels, oil steamers and colliers are provided with inner bottoms for purposes of ballast, the space between the bottoms being used as tanks for water ballast.

At certain positions throughout the ship are located water-tight partitions, or bulkheads; those in the middle portion of the vessel are necessarily determined by the arrangement of the boilers and machinery, but every effort is, or should be, made to allow at least any two of the compartments bounded by the bulkheads to be filled with water without endangering the stability of the vessel. The foremost bulkhead of all is called the collision bulkhead, and is located one half the maximum breadth of the vessel from the bow. This bulkhead is especially stiffened and braced to withstand the pressure of the water against it in case of injury to the ship forward of it. In metal vessels bulkheads have two functions to perform—one to serve as a structural tie uniting the sides of the vessel, the other, by far the more important, as structural strength can be obtained in other ways—is to confine the inflow of water in case of damage to the compartment injured. Owing to the recent loss of several vessels by collision that were supposed to be amply secure by reason of their bulkheads from loss, the rules of the underwriters have been revised, so as to provide for the plating being stiffened to such a degree as to prevent the bulkhead giving way under pressure. The pressure per square inch due to a head of water of 10 feet is 4 1-3 pounds; therefore, the bottom plates of bulkheads of ships drawing 25 feet may, in case of injury, be subjected to a pressure of 14 8-10 pounds per square inch. Very efficient stiffening must be provided to enable the plating to withstand such pressure. The best method of construction is to have the plating worked horizontally with heavy vertical stiffeners bracketed at the heads and heels. The stiffeners may be of rolled shapes or built up of plates and angles, as the depth and width of the bulkhead may require. In addition to the vertical stiffening, horizontal webs are sometimes worked on the opposite side of the bulkhead, with their ends securely bracketed to the ship's side.

IMPORTANCE OF UPPER DECK STRENGTH.

The upper deck, to which is carried the full scantling of the vessel,

plays a very important part in the structural strength. The arrangement of the material subject to longitudinal stress may be compared to a beam, of which the upper deck is the top and the keel the bottom flange, the outside plating forming the web of the mean; therefore, this deck in vessels of large size is plated completely over, in order to secure for the top flange of the girder the proper sectional area. On the ends of the beams are worked stringers of heavier plating than the balance of the deck plating, making good connection with the sheer strake by means of heavy angle bars; the space between the stringers is filled in with plating as required. Great care is given to the butts and other connections, so that the entire deck may be as efficient as possible. In wooden vessels the strength at the deck is made up through the waterways, thick strakes and clamps, or shelves, which are strong pieces of timber or plank, running longitudinally. The decks of an iron vessel are worked in a similar manner to the upper deck except that where the frames pierce the plating staple angles are worked about them to make it watertight. Deck beams should be supported by stanchions, and as far as possible these should be in the midship line, but for convenience of state rooms and deck arrangements they are sometimes worked two to a beam placed beside the joiner work bulkheads.

The fastenings of a wooden vessel are either of copper or iron bolts, iron spikes and treenails of wood. The plank is fastened generally by spikes or treenails except at the butts, which are bolted. Several bolts are also placed in each shift of plank for additional security. Many parts are thoroughly bolted. The fastenings of a metal vessel consist almost entirely of rivets, which are hammered into place while hot. A rivet gang consists of three men and a boy, the rivets being heated in a furnace with capacity to supply two or more gangs. The rivet boy carries the rivets from the furnace to the work by means of tongs and places them in the holes in the plating, one of the men, known as the holder on, places a heavy bar of iron against the head to keep it in place while the point or clench is being formed by the two riveters, who by repeated and rapid blows force the soft iron into the countersunk hole in the plating, making the merry din so familiar to visitors at ship yards. After the rivet is driven down hard and flush, it is tested by the rivet inspector for watertightness, and if not satisfactory must be redriven.

When the planking is fastened, the seams of slight spaces between the edges of the plank are filled with oakum, and this is driven in with great care until it is as hard as the plank. To hold against the oakum the planks are laid with a slight bevel outward, about one-sixteenth of an inch for each inch of thickness of plank; otherwise the oakum would be forced through the seam. An improved method has been lately introduced whereby a recess is cut in the edges of the plank about midway of the depth, so that the oakum will spread into the recess and render it impossible to be driven through. After the calking, the seams are payed with hot pitch, a marine glue. In metal vessels all watertight work must be calked, metal to metal; that is, a slight layer of metal must be driven over against the adjacent metal until the joint is absolutely tight. This work, until within the past few years, has been done entirely by hand; now a calking tool, operated by compressed air or electricity, is used. The blows are so rapid that it produces almost a flow of the metal.

PREPARATIONS FOR LAUNCHING.

The vessel has been built resting upon the keel blocks and shores, and while here the shafting and propellers have been put in place, the rudder hung, the bottom painted, and all work below the waterline on the outside surface finished. Now the vessel is to be transferred from the fixed keel blocks to a moveable platform, which shall allow the vessel to move easily, and without damage, to the water. This is done by building on each side of the vessel about one-fourth of the beam from the keel a platform, or foundation, to which the weight of the vessel shall be transferred. In laying the keel blocks the bottom pieces were made of sufficient length to allow of their forming the foundation of the platform. On these are built up the ground ways, which are capped with strong pieces of timber 3½ to 4 feet wide, with smooth upper surfaces shored to prevent spreading; on these are laid the bilge ways, which are also large, smooth pieces of timber, free to slide with the vessel; on the bilge ways are constructed the cradles which are fitted to the ship's bottom; between the cradles and the bilge ways are fitted rows of long wedges of such thickness that when driven up the vessel will be lifted from the keel blocks and brought to bear on the ground ways. The upper surface of the ground ways and the bottom surface of the bilge ways are then coated with tallow and the bilge ways secured to the ground ways by strips of timber at the bow, so that they cannot move until the strips are sawn asunder. Then the wedges are set up until the keel blocks can be removed, and all clear for launching; when all is clear, the strips at the bow are sawn off and the vessel, resting on the greased surfaces only, begins slowly to slide down the inclined plane prepared at building; she soon gains headway, and is shortly in the water. After launching the fitting of the joiner work and cabins, the putting together of the machinery, the masts and rigging of the ship are all hurried to completion until the vessel complete in all respects with outfit on board is ready to be delivered, and take her place for service.

AWARDS OF PRIZE MONEY.

The disbursements of the navy department during the past year aggregated more than $70,000,000, according to the report of F. H. Morris, auditor of that department. In the report, which has just been issued, Auditor Morris says that the settlement of prize money claims for the Spanish war has not yet been begun, for the reason principally that there have been delays in the courts. The work of the auditor's office, he says, will be very protracted and arduous as soon as these settlements begin. The report shows that the total number of accounts and claims of naval officers settled during the last fiscal year was 8,132, and the amounts allowed aggregated $50,997,411. The total appropriations and balances of the navy during the last year were $138,772,420. The net amount drawn out by warrant was $70,130,148, and the balance unexpended on June 30 last was $68,471,250. A small deficiency in funds necessary to be expended for the maintenance of the naval establishment during the current fiscal year is predicted by the auditor. The total disbursements of the navy department through its fiscal agents in London, England, during the year ended June 30, were $3,195,899, the sum including payment for several vessels of war purchased last year.

AMERICAN MACHINERY FOR BELLEVILLE BOILER WORKS.

As a result of a recent visit to this country of Messrs. L. Piaud and G. Bische, representing the Delaunay Belleville Co., well-known manufacturers of water tube boilers of Saint Dennis, France, an order has been placed through Manning, Maxwell & Moore, of New York, for $50,000 worth of engine lathes, radial drills, milling machines, boring and turning mills, cutting-off machines, large planers, etc. The machinery purchased will constitute the equipment of a new plant in which the French firm will undertake the building of an engine ranging from 8 to 2,000 horse power for land and marine service. The French manufacturers sailed for home, recently, after several weeks spent in the inspection of American ship building and manufacturing plants. At Chicago they were taken through the works of the Q. & C. Co. and the Chicago Ship Building Co.; the latter, they declared, interested them very much. The works of Bement, Miles & Co. of Philadelphia and other prominent eastern concerns were visited, but what interested them most was the Cramp ship yard. Said M. Piaud: "I cannot help remarking the immense possibilities of that concern." The visitors, while bestowing high praise on American automatic tools, enter a protest against the prevailing high prices and poor promises of delivery. In conclusion, however, M. Piaud said: "Our new engine shops will be run on American principles, as far as practicable. This is only an initial order I have given, and as we extend our works I will pay America another visit, when I may possibly double the order."

OLDEST AMERICAN VESSEL IN COMMISSION.

The schooner Polly, now lying in the port of Bangor, Me., sound and seaworthy in every way, was built at Amesbury, Mass., in 1805, and is said to be the oldest American vessel in commission. During the war of 1812 she was a privateer, and captured eleven prizes from the British. She was also captured once herself, but was retaken. She is a vessel of 45 tons, and is now engaged in the coasting trade. There were three privately armed vessels called Polly in commission during the war of 1812—a schooner carrying four guns and thirty-five men, and another carrying six guns and two hundred and thirty-five men, commanded by Captain Lafavour, and a sloop Polly carrying five guns and fifty-seven men, commanded by Captain T. Handy. This last vessel and one of the schooners was from Salem. One of these vessels had an encounter with a British man-of-war and beat her off with loss in 1812. Another Polly, or perhaps the same as the last, was captured by the Barbadoes, 16, off San Domingo in April, 1814, after a chase of sixty hours. Another Polly was captured by the Statira, 38, off the Bay of Fundy, 1812. She beat off a sloop of 18 guns with a loss of many of her crew. Polly seems to have been a favorite name for public and privately-armed vessels during the Revolutionary war. There were at least a dozen of them, besides a Polly Sadler and a Polly Sly. A cruiser Polly, fitted out in Charleston, S. C., composed one of Commodore Biddle's squadron at the time he was blown up in the Randolph frigate.—Army and Navy Journal.

CHART OF THE WORLD.

A new chart of the world, setting forth the ocean tracks for full powered steam vessels with the distances in nautical miles, has just been issued by Capt. J. E. Craig, chief hydrographer of the navy department. A noteworthy feature of the new chart is the presentation of the tracks connecting the ports of New York and San Francisco with the new American possessions. It is shown, for instance, that the construction of the Nicaraguan canal would bring the Philippine islands only about 500 miles nearer the port of New York than by the present route. Were the Nicaraguan canal constructed a vessel sailing from New York to Manila would have to cover 11,034 miles, making a difference of 552 miles in favor of this route over that of the Suez canal for New York.

The longest stretch of the cable which the administration expects congress to authorize during the coming session will be from Guam to Midway, 2,304 miles. From Midway island to Honolulu the distance is 1,160 miles, and from Honolulu to San Francisco 2,100 miles. The chart shows in the Atlantic ocean the tracks used by steamers connecting New York, Boston, Philadelphia and Liverpool, Southamption and Gibraltar, showing the northern routes, used between August and January, and the southern routes, followed between January and August. The longest steamer route given on the map is that connecting New York and Esquimault by way of Cape Horn, 16,290 miles. This is exceeded by the track used by sailing vessels connecting New York and Yokohama via the Cape of Good Hope, which is 16,900 miles in length.

A REPLY FROM COMMISSIONER CHAMBERLAIN.

Commissioner of Navigation E. T. Chamberlain has effectually spiked one of the guns which the New York Post has been using extensively in violent and bitter opposition to the Hanna-Payne shipping bill. Mr. Chamberlain's self-explanatory letter is as follows:

To the Editor of the Evening Post:—My attention has been invited to the surprise expressed in your editorial article of Aug. 4, that under the so-called Hanna-Payne bill, the International Navigation Co. would get from the government in twenty years twice the cost of each of its fast steamers. The alarm which the statement may arouse in your readers' minds may perhaps be quieted by the reflection that last year the German government voted a subsidy of 5,590,000 marks to the North German Lloyd Steamship Co. for fifteen years, and the company, in its argument for the bill, declared its purpose to build four steamships, each to cost 4,000,000 marks. The North German Lloyd company will thus get from the German government for the next fifteen years more than the entire cost of a steamship a year!

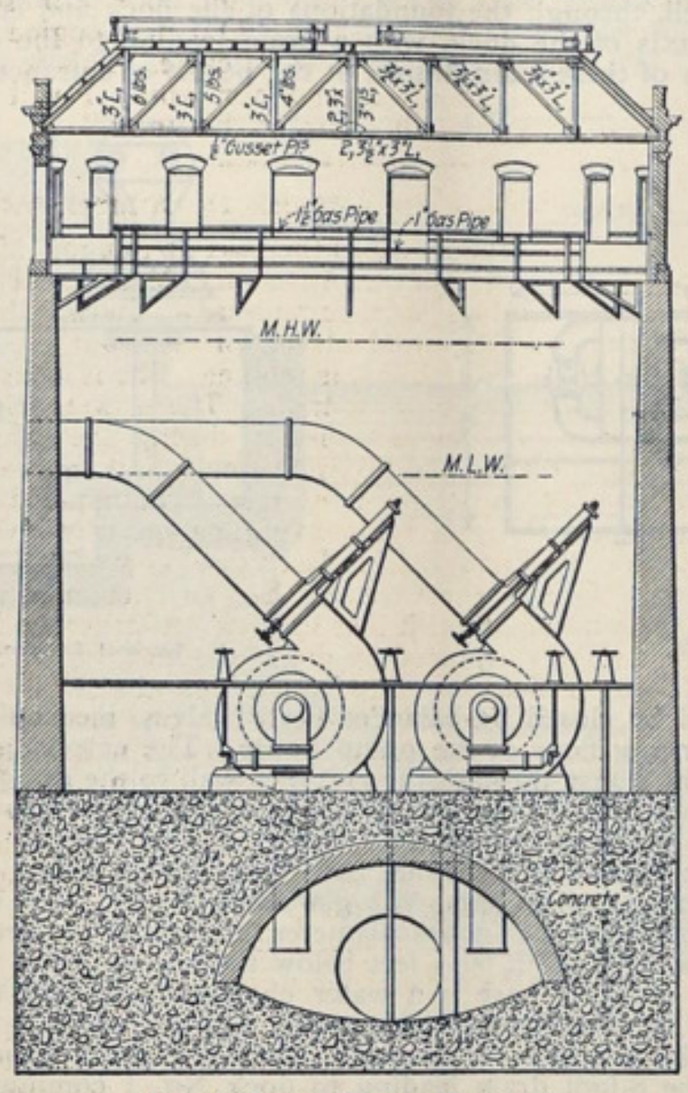
E. T. CHAMBERLAIN.

It will be two or three weeks before the navy department will be able to announce the result of the competition for the contract of installing an electric plant of great power at the new machine shop of the Brooklyn navy yard. The bids cover boilers, engines, dynamos, cranes, etc., and range from $120,000 to $160,000. The General Electric Co. is among the bidders.

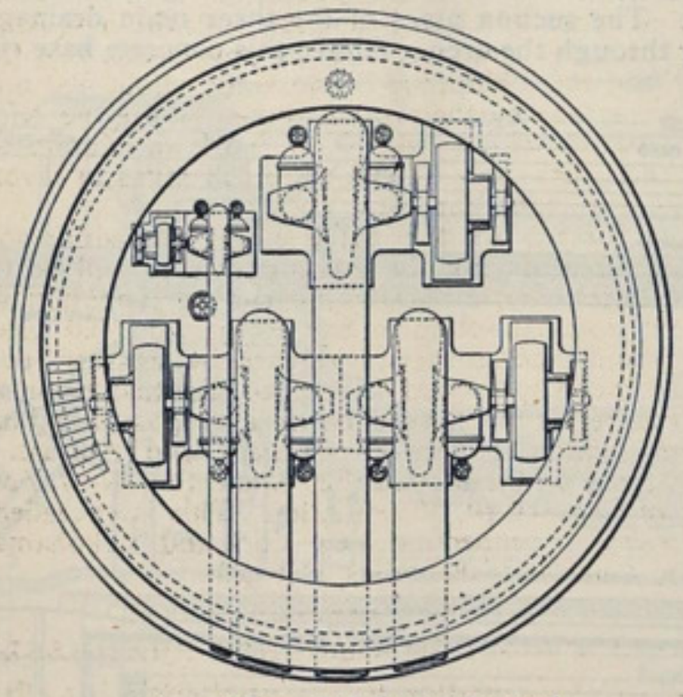
NAVAL DRY DOCK AT BOSTON.

THE LARGE CONCRETE STRUCTURE FOR THE CONSTRUCTION OF WHICH A CONTRACT WAS AWARDED EARLY IN THE PRESENT YEAR AND WHICH IS TO COST $1,025,000.

The drawings herewith presented will convey to readers of the Review a fairly accurate idea of details of the construction of the new dry dock, for the construction of which at the Boston navy yard the secretary of the navy some months ago let the contract to O'Brien & Sheehan of New York, the price being $875,000 for the dock proper and $150,000 for electrical and other machinery, bringing the total up to $1,025,000. The drawings and description of the dock are reproduced from the Engineering News. It will be remembered that under the pressure of demand for more and larger dry docks for the ships of the "new navy," and attracted by the relative cheapness and speed of construction, the United States navy department, about 1886, adopted timber as the material of construction for its dry docks. Between 1887 and 1897 docks of this type were built at New



Vertical Section Through Pump Well.

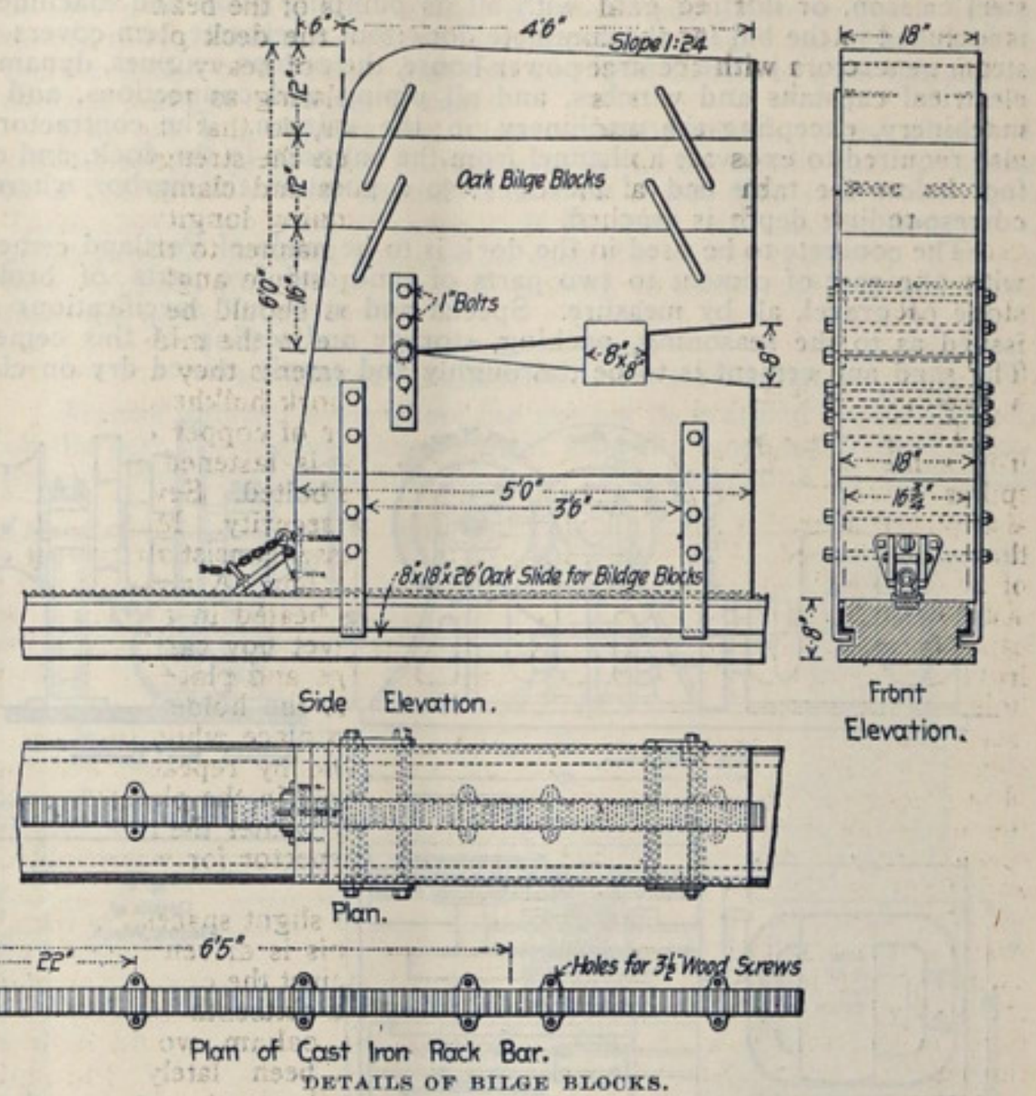


Plan of Pump Well Grating Removed.

ELEVATION AND PLAN OF PUMPING PLANT.

York, Norfolk, League island, Port Royal and Puget Sound; and the last congress, in spite of the able argument for stone docks presented by the present chief of the bureau of yards and docks, provided for four more timber docks. The bill, however, did finally make a concession to the effect that the secretary of the navy might, in his discretion, build one of these docks of stone; provided that the cost of this stone dock would not exceed $1,025,000, or about 25 per cent in excess of the limiting cost of timber docks, fixed at $825,000 each. For a long time past Rear Admiral Endicott, chief of the bureau of yards and docks, and other well informed naval officials, have been doing excellent missionary work in the cause of stone or concrete construction for government dry docks, and some of their very convincing arguments have been presented in the Marine Review from time to time. Firm in his convictions in this matter, it was only natural that Rear Admiral Endicott resorted to extreme measures in his pleadings with the navy department. As a result, the secretary of the navy exercised the discretion granted him in the case of the Boston dock, and on Jan. 31, 1899, he invited proposals for stone, and stone and concrete combined, for the dock at that yard. Several favorable proposals were received, and on Feb. 6, 1899, the contract for a concrete dock, with rubble filling and lined with cut granite, was awarded to the firm of O'Brien & Sheehan of New York city.

This dock will be completed within two and a half years. The borings made at the site of the new dock show that at a depth of about 25 feet below mean low water a bed of compact clay and gravel is encountered, with some thin sand strata, possibly containing water. The position of the



DETAILS OF BILGE BLOCKS.

new dock is about midway between the old stone dry-dock, finished in 1833, and the larger of the two "wet-basins," and parallel to the old dock. The general dimensions of the dock will be as follows:

	Feet.	Inches
Length on coping, from head to outer end of table	788	0
Length on coping, from head to outer gate-sill	750	0
Length on floor, from head to outer gate-sill	729	0
Length on floor, from head to inner abutment	689	0
Width on coping in body	114	0
Width on floor in body	72	0
Width on coping at abutment, least	101	8⅝
Width at entrance on mean high water level	100	0
Depth from coping to mean high water	5	2
Depth from coping to floor, in body	39	2
Draught over sill at mean high water	30	0

Under the terms of the contract this dock is to be built of concrete, with rubble stone fillers, and lined with cut-stone masonry, as shown in the cross-section illustrated. When the excavation has sufficiently advanced so as to fully expose the character of the underlying material, the

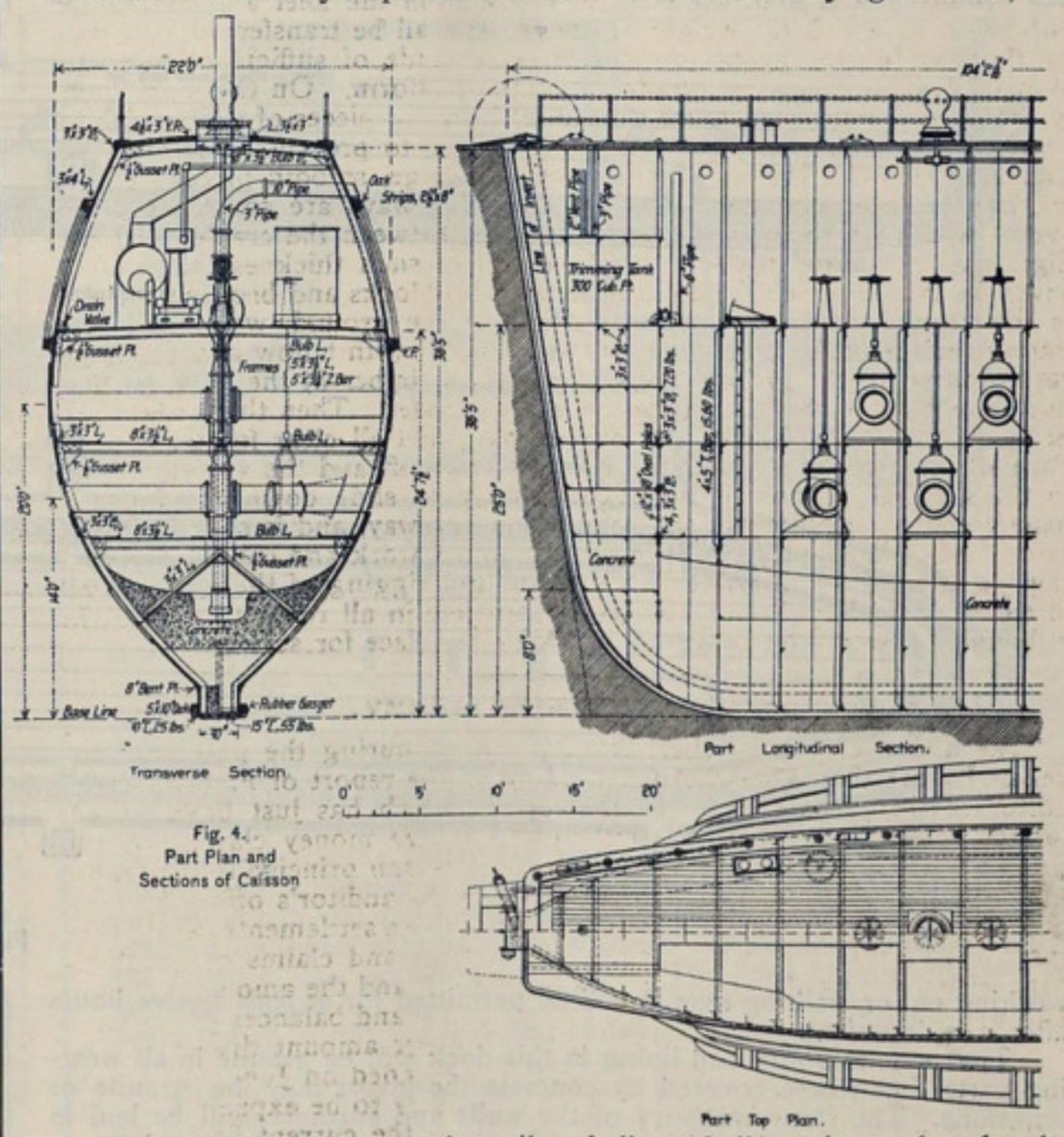


Fig. 4.
Part Plan and Sections of Caisson

government will decide whether piles shall or shall not be used under the dock; the present borings, however, would indicate that the soil is sufficiently compact to omit piling. A price for piling and framing, in accordance with plans made, was obtained in the bids submitted; to be separately considered. In addition to the dock, there will be a pump house, one story in height, built of granite, with steel roof trusses and a copper roof.

The necessary culverts and wells will be made of concrete and lined with glazed brick. There will be three main drainage pumps, of the centrifugal type, with separate electric motors, balanced and driven by vertical compound engines, and four steel boilers will be included in this plant. The steel caisson, or floating gate, with all its pumping plant and machinery, is included in the bid for the complete dock; but a separate item covers the steam generators in the central power house, the pumps, engines, dynamos, electrical capstans and winches, and all machinery, excepting the machinery in the caisson. The contractor is also required to excavate a channel from the entrance to the dock, and one foot below the table end of the dock, to a point in the harbor where a corresponding depth is reached.

The concrete to be used in the dock is to be made of Portland cement; with one part of cement to two parts of sand and five parts of broken stone or gravel, all by measure. Special and stringent specifications are issued as to the seasoning, packing, storage and testing of this cement. The sand and cement is to be thoroughly and evenly mixed dry on close

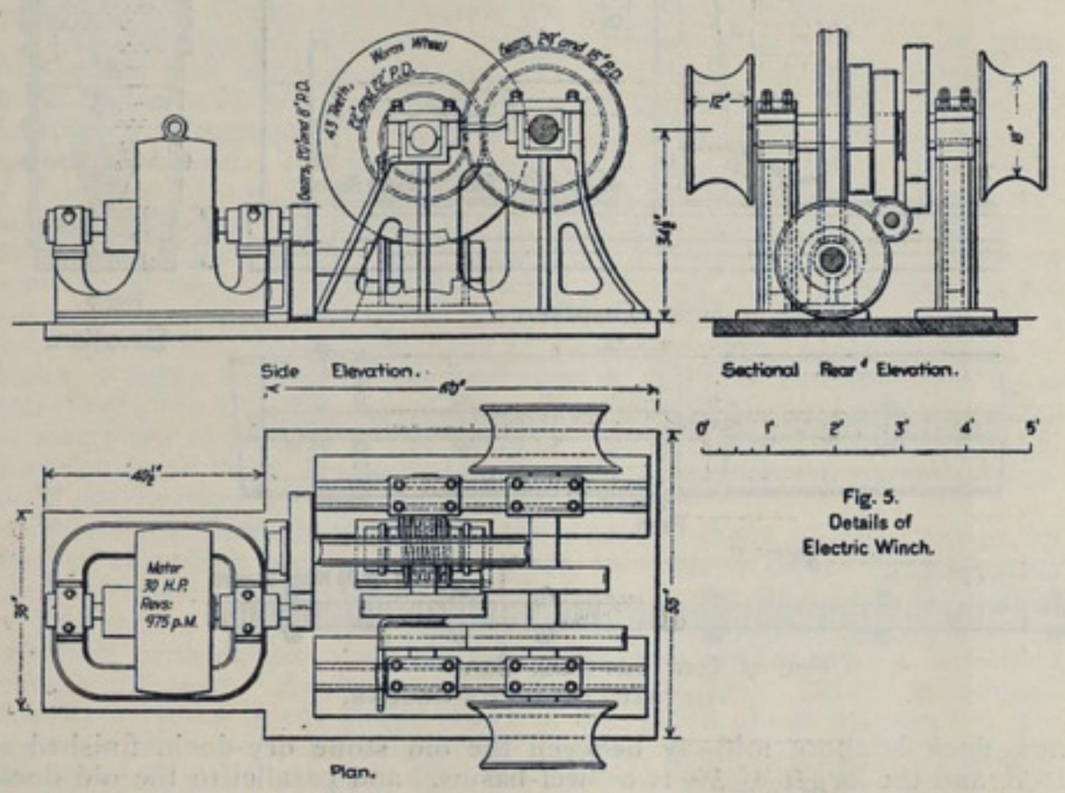
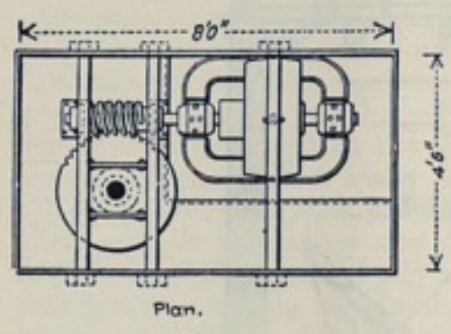


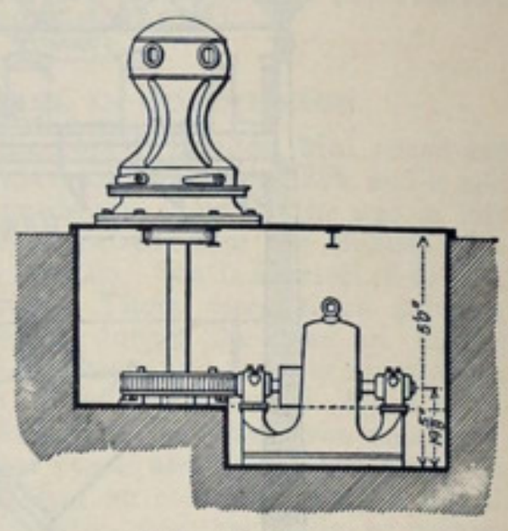
Fig. 5.
Details of
Electric Winch.

platforms, after which a spray of water is to be applied until the paste assumes a proper and uniform consistency. This mortar is then uniformly spread over the previously moistened gravel or broken stone, which has been disposed in an even layer on the platform, and the whole will be turned over at least three times and thoroughly mixed. This concrete will be deposited in the work in layers not exceeding 9 inches in thickness and thoroughly rammed. To avoid all horizontal joints in this concrete work, the contractor is required, where the concrete is not too deep, to take up for construction a length that can be completed in one day, and finish off in steps to where the work is to begin on the following day. He must then start the work in a bed of 2 inches of neat cement, after the surface has been well cleaned. All concrete started on a dry surface must be bedded in this 2 inches of neat cement. No concrete can be used after it has commenced to set; and after it is in place and rammed, no stepping, working on, or walking over it will be permitted for at least twelve hours after it is deposited.

The stone masonry and lining in this dock will be granite in all wearing parts; but where covered by concrete the invert may be granite or limestone. The stone masonry of the walls and entrance will be laid in continuous courses of ashlar, patent-hammered on the face and 6-cut. Beds and joints must be dressed to form ⅜-inch joints, and the whole will be laid in Portland cement mortar, made one part cement to two parts of sand. The face joints must be picked-out to a depth of at least ½-inch, and then pointed with Portland cement mortar, one cement to one sand, well pressed in and finished. The coping stones are not to be less than 2 feet thick, 3 feet wide and 4 feet long, and they must have a smooth surface. Headers must occupy at least one-eighth of the face area of the walls, and hold their width so as to be at least 2 feet wide at the tail. The invert is to be 3 feet deep, and granite is to be used at the ends which show in the dock and receive the thrust and wear of shores, and limestone between these ends. The meeting faces for the caisson must be dressed perfectly smooth so as to form watertight joints; and the stone must be worked out to form all angles.

As shown on the drainage plan, there will be four longitudinal subfloor culverts, extending from the head of the dock to near the abutment, where they join a semicircular cross drain of 6 feet radius. The subfloor drains have concrete floors and sides; and the cross-drain has a concrete floor and arch, stiffened under the keel blocks with steel I-beams; the cross-drain opens into the sump of the 8-foot main drainage culvert leading to the pump well. The entrance to this main drain is covered with an iron grating, 10 by 16 feet, with openings exceeding the total cross-section of the main drain. Another 8-foot circular culvert of concrete, lined with glazed brick, similar in all respects to the main drainage culvert, will lead from the pump well, through the foundations of the dock and connect, 68 feet beyond the axis of the dock, with a drain leading to the old dry dock, No. 1. Both of these main drains, at the points of entrance into the wall





chamber, will be closed by balanced gate valves mechanically operated from the working floor of the pump house. The emptying culvert leads from the pump house through the entrance wall to the dock; and this culvert rests on timber foundations and is of semicircular cross-section, with a radius of 9 feet 6 inches.

The pump house and well are built of masonry, with a cast iron floor and a steel frame roof covered with glass and copper. The concrete foundation is about 50 feet 6 inches diameter, and about 21 feet deep, resting on gravel and clay about 60½ feet below the coping level. In this Portland cement concrete base is a water chamber, about 30 feet long, and formed by a brick arch of 12 feet radius and an invert of 24 feet radius. One end of this chamber connects with the 8-foot main drain from the new dock; and the 8-foot drain leading to dock No. 1 communicates with a branch chamber, of similar dimensions, leaving the main chamber about at its center. The suction pipes of the three main drainage pumps enter this chamber through the arch. Above this concrete base rises the circular

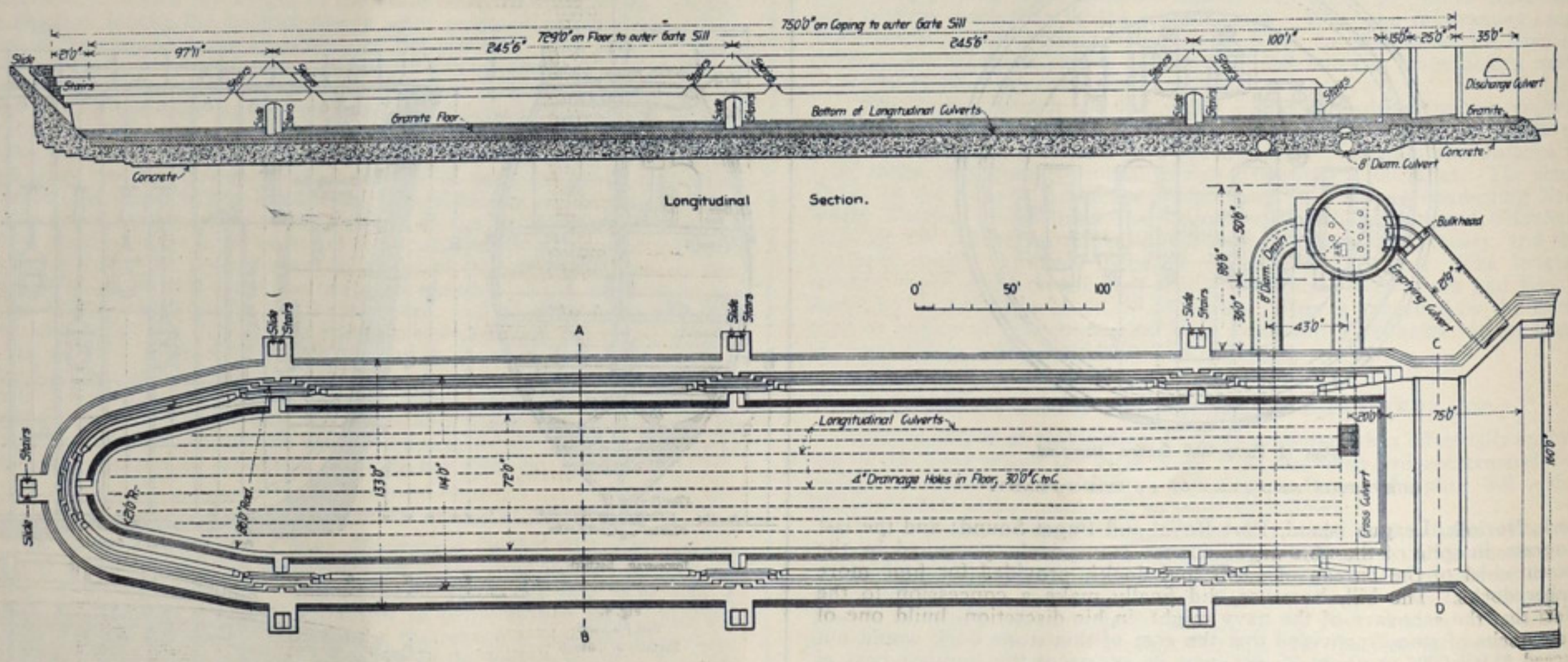


Fig. 1. General Plan and Longitudinal Section.

wall of the pump house, 43 feet 6 inches diameter, laid with hard burnt red brick in Portland cement, and faced inside with white glazed brick; the outer face of this well will be protected by 1 inch of asphaltum applied hot, and the inside surface of the wall must remain dry. About 8 feet above the concrete base there will be a steel frame and cast iron grating working floor. The superstructure of the pump house will be about 49 feet outside diameter, and 20 feet nigh, provided with doors, windows, gallery, stairs, etc. The walls will be rock-face and 6-cut granite, and glazed brick will be used for an inside lining.

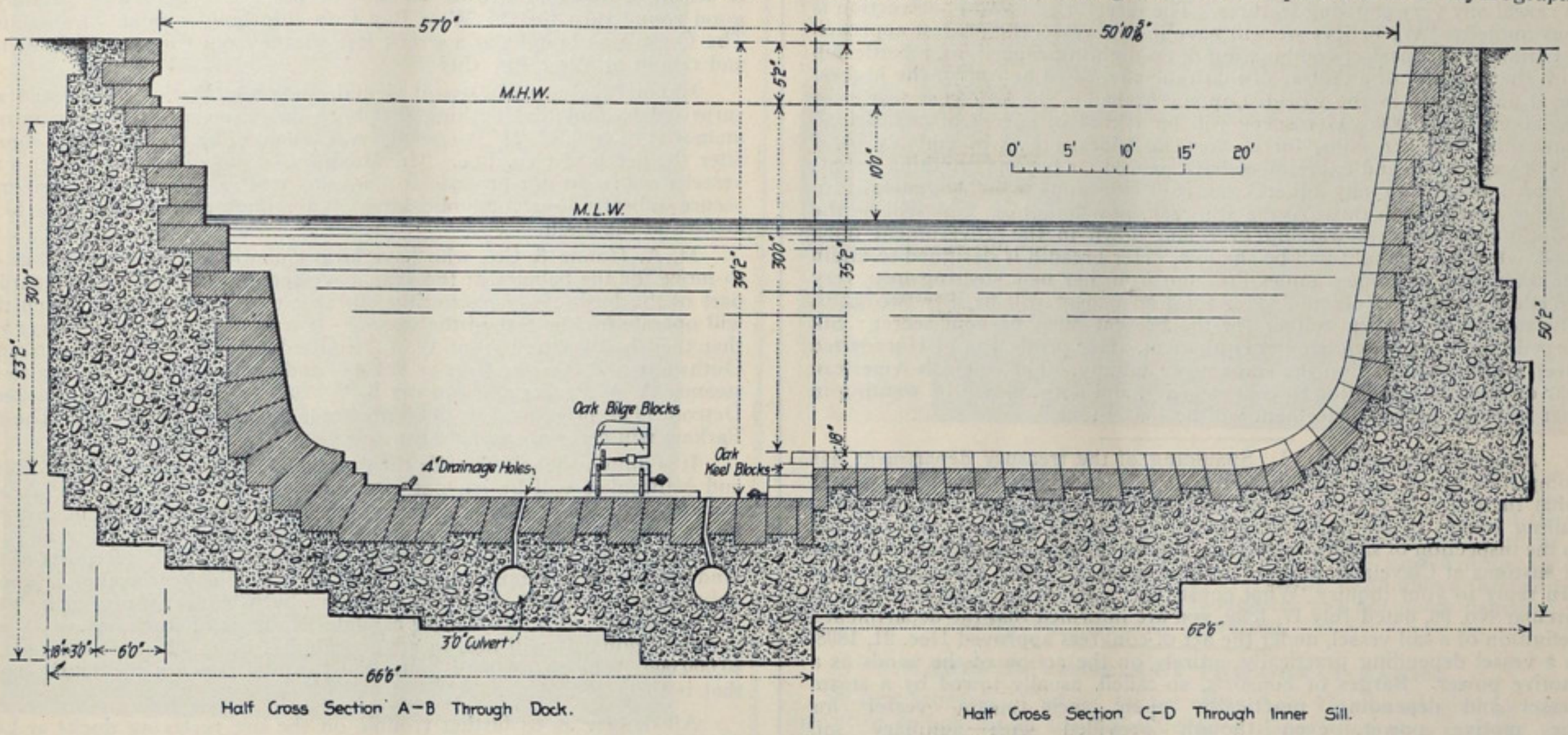
The pumping plant will include three independent centrifugal pumps, with separate motors, for pumping out the dock; and one centrifugal

drainage pump and motor. There will be two vertical, cross-compound, condensing, automatically governed engines, with each engine connected with two dynamos; and also four steel boilers. The pumps admit water on both sides of the disc, and the runner shaft will be directly connected with the armature shaft. The general plan calls for an average discharge for each pump of 43,000 gallons per minute; the minimum required mean discharge duty of the three pumps is thus 135,000 gallons per minute, measured while pumping from mean low water to floor level. The efficiency of the machinery in the pump well must not be less than 55 per cent. The main pumps, as designed, contemplate a 6-vane runner, 79 inches diameter, a single 45-inch discharge pipe, and two 32-inch suction pipes, joined by quarter-turn bends to each side of the pump casing, and inclosed runner, so as to balance the runner and avoid end thrust. There will be three double-gate valves to each pump; one on the discharge and one on each suction pipe. The drainage pump will have a 34-inch runner, and be direct-connected to an electric motor placed on the same bedplate; the suction and discharge pipes will be 14 inches diameter.

There will be four 200-kilowatt dynamos, of the compound wound, direct current, constant potential, 125-volt type, arranged for direct connection with overhung armatures. The fields are to be multipolar; and the commercial efficiency of the dynamos must not be less than 92 per cent with full load; 90 per cent with half, and 85 per cent with quarter load. One 300-kilowatt motor will be directly-connected to the runner-shaft of each of the three main pumps; and one 50-kilowatt motor will drive the runner-shaft of the drainage pump. Each engine, running two dynamos, will run, condensing, with 100 pounds initial steam pressure and 26-inch vacuum, and develop continuously 600 I. H. P. The working boiler pressure will be 125 pounds gage, and the speed of the engine is to be 150 revolutions per minute, with a variation in speed not exceeding 1 per cent with any change of load.

The steel caisson, or floating gate, will have an extreme length of 104 feet 2 7-16 inches; molded breadth, 22 feet; and a depth of 36 feet 5 inches from the bottom of keel to the under side of upper deck. It will be built, as far as possible, of open-hearth steel, with welded members of wrought iron. The keel and stems must be 30 inches wide, outside of channels, and made of two 15-inch by 55 pounds channels connected to side plating by rivets spaced 4½ inches on centers. The transverse frames are spaced 24 inches on centers; alternating 5 by 3½ inches by 13.6 pounds, and 5 by 3½ inches by 17.8 pounds Z-bars. The deck stringers and beams and floor plates, etc., are shown on the plan. The channel for gate packing running the entire length of the keel and stems along the outer edge on both sides of the caisson, is steel, 10 inches by 25 pounds, fastened by ⅞-inch rivets. Inside these channels is fitted a thick rubble packing secured by an oak timber 5 inches thick. In the hull of the caisson will be thirteen 20-inch valves connected with 20-inch wrought-iron culverts, for flooding the dock, and there will also be two 20-inch sinking valves for use in settling the caisson into place. The centrifugal pump in this caisson will have a capacity of 3,000 gallons per minute with mean lift, and it will be driven by an inverted, vertical engine of acceptable design. The bottom of the caisson will be filled with Portland cement concrete ballast, and there will also be sufficient movable cast iron ballast to give the caisson a floating draught of 18 feet 6 inches.

The oak bilge-blocks and slides are fully shown in the plans. The six electric capstans, three on each side of the dock, will each be operated by a 22.5 K-W. motor, contained in a pit 5 feet deep under the capstan. Three electric winches, of about 25 K-W. each, will also be installed, one at the head of the dock and one on each side of the entrance. There will be a separate underground circuit leading to these capstans and winches from the power plant.



Half Cross Section A–B Through Dock. Half Cross Section C–D Through Inner Sill.

Fig. 2. Cross Sections of Dock.

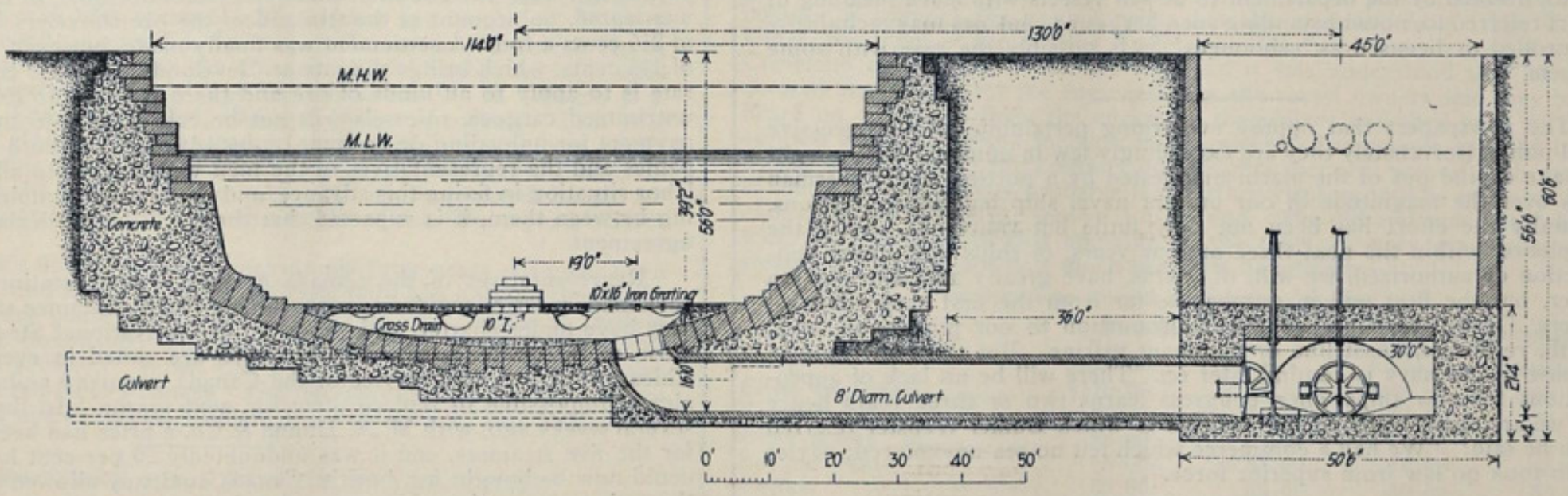


Fig. 3. Cross Section Showing Drainage Culverts and Pump Well.

EXTENSIVE HYDROGRAPHIC WORK.

Marine interests everywhere can not but be gratified by the disposition on the part of maritime nations, or at least the more progressive ones, to devote constantly increasing sums to the prosecution of hydrographic work. The British Admiralty, for instance, now keeps from ten to a dozen vessels constantly employed in hydrographical surveying in various parts of the world. It may be noted too that the work of the Admiralty is admirably supplemented in efficiency by the co-operation of the officers of British naval and merchant vessels. To what an extent this is true is indicated by the yearly reports submitted. One of these, not far back, showed that whereas the British surveying vessels discovered but twenty-six dangerous rocks, thirty-five were found by other British naval vessels, twenty-two by British or foreign merchantmen, and a total of 105 were reported by colonial and foreign governments. All of these rocks were discovered by investigations, while thirteen others were brought to light as the result of the stranding of vessels. The total number of obstructions annually reported is usually in the neighborhood of 200. In 1897 the number dropped to 190, but last year showed an increase to 230.

The new White Star liner Oceanic is now being insured at Lloyds and by various companies. She is valued at $2,500,000, of which the owners will run $750,000 uninsured. Thus far the placing of the insurance has been affected at 55 shillings per cent. for the twelve months, free from the particular average, unless the damage is occasioned by stranding, sinking, burning or being in collision. The Oceanic sails from Liverpool for New York on her maiden trip Sept. 6.

MARINE REVIEW

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An Associated Press despatch of recent date from London says that Sir William White, director of naval construction in England, is making great claims for a new vessel of war to be laid down in November at Davenport and which is to be completed within a year. The despatch says that the vessel is to be a great triumph of naval architecture, both for speed and fighting, but the details of the ship given in the interview do not seem to reveal any very startling features. The director of naval construction is thus quoted: "We believe we will have in this vessel the nearest approach yet attained to a perfect combination of the fighting capacity of a battleship with the mobility of a cruiser of that type advocated by one of the highest naval authorities in the world, Captain Mahan. She will cost ready for sea about £1,250,000. Her speed will be a knot in excess of any British battleship, and her guns, turret, torpedo tubes, etc., will embody ideas which experience and experiment have proved far beyond anything yet attempted in this or any other country. Her guns will be generally of smaller caliber than those of the Bulwark, now building. She will be the longest and broadest warship ever laid down in the government dock yard, while her draught will be shallow. Her breadth is designed to attain the maximum steadiness under fire, and from her new steering gear very excellent results are certain. Her total armament will be fifty-two guns. The details as to their caliber for the present must be kept secret. Six torpedo tubes will complete her equipment. Her protection of Harveyized steel will be less than on the ships now building. The Spanish-American war directed our attention to coal capacity, and nothing will be wanting in that respect. Her displacement will be 13,000 tons."

Assistant Secretary O. L. Spaulding of the treasury department has completely set at rest all question as to whether tow barges, no matter what their size may be or the number of men caried, are to be classed as sailing vessels in the application of the law of the last congress relating to the inspection of sailing vessels. In a letter to the special deputy collector of customs at Cleveland, under date of August 11, Mr. Spaulding says: "In reply to your inquiry 'What constitutes a sail vessel?' as described in circular No. 96, dated July 17, 1899, you are informed that the department's definition of a sail vessel, under the act of congress approved Dec. 21, 1898, is a vessel depending practically entirely on the action of the winds as a motive power. Barges or consorts, so-called, usually towed by a steam vessel and depending practically upon such steam vessel for the motive power, even though provided with auxiliary sail power, for use in emergencies, or for steadying the vessel in a sea way, are not deemed by the department to be sail vessels within the meaning of the act referred to, notwithstanding such barges or consorts may technically be enrolled or licensed as 'schooners,' as is possibly the case with some of them."

The newspapers that oppose everything pertaining to a progressive naval policy (fortunately they are exceedingly few in number) have sought to make capital out of the alarm manifested by a portion of the German press over the magnitude of our present naval ship building operations. Naturally the effort has been not only futile but ridiculous. With the completion within the next three or four years, of ships now under construction or authorized, we will, of course, have greatly added to our sea power, but the fleet will in number be far from the first rank of naval powers. It will certainly not be in proportion to our population, area, wealth, resources, coast line or merchant marine. But the right kind of increase in our navy is coming later on. There will be no lack of appropriations for new ships when congress learns two or three years hence that we are again reaching the position to which Daniel Webster referred when he said: "We had a commerce which left no sea unexplored; navies which took no law from superior force."

New York shipping men are becoming more and more aroused over the decline of the grain trade of the metropolis. It is being generally attributed to the fact that the railroad terminals are not on the water front, thus necessitating the grain being carried in lighters to the side of ships. The commission appointed during the administration of Governor Black to inquire into the causes of the decrease of New York's foreign trade is going steadily forward with its investigations. It is pretty certain to report, for one thing, that the docking facilities must be increased and that some remedy must be found for the lightering of grain, which the commission has learned entails an expense of 3 cents per bushel, despite the contention of the railroads that there is no difference in cost owing to lightering.

Referring to the significance of the establishment of the new plant of the New York Ship Building Co. at Camden, N. J., the New York Commercial says editorially: "It is evident that this country is no longer to lag as a constructor of seagoing craft. The fact that for more than a generation capital was timid about investing in such enterprises has lead the world to believe that this is not a ship building country. There is not a product which enters into the construction of a vessel which we have not at hand. Our forests furnish the timber and our mines the metal. Proper encouragement from congress should place us in the front rank. This encouragement, there is reason to believe, will be forthcoming before another year has passed."

AROUND THE GREAT LAKES.

Mr. A. C. Adams of the Hand & Johnson tug line, Buffalo, will not be secretary of the consolidated tug companies. The report to that effect was in error.

The Michigan Wrecking & Salvalage Co. of Detroit is engaged in raising the steamer A. Y. Gowen of Cleveland, which caught fire at Detroit several days ago and was sunk off Fort Wayne.

The American Steel & Wire Co.'s iron mining interests are to be operated under the name American Mining Co., and the ships, formerly Wolvin steamers, under the name American Steamship Co.

A despatch from Minneapolis reports the lease of the Stevens mine, Mesabi range, from Henry Stevens of Detroit to the Oliver Mining Co. for fifty years at 15-cent royalty and a minimum output of 100,000 tons annually.

W. L. Mercereau of Saginaw has been appointed superintendent of the Flint & Pere Marquette Railway Co.'s water service and is already installed in his new position. Chief Engineer Bruce will remain in charge of the machinery department.

James Davidson has sold the schooner George B. Owen to the Mitchell & Rowland Lumber Co. of Toledo for $25,000. There was certainly a good round turn for the West Bay City ship builder in this transaction. The Owen was bought as a wreck last winter from Chicago underwriters and rebuilt at West Bay City.

Mayor Maybury of Detroit visited Sault Ste. Marie recently and was surprised to find that nothing had been done towards the erection of a memorial to Gen. O. M. Poe, which was talked of by vessel owners shortly after the death of Gen. Poe. Mr. Maybury is quoted as saying that if the vessel owners do not propose to take this matter up he will endeavor to secure subscriptions for some kind of a monument to Gen. Poe to be erected at the Sault.

M. A. Hanna & Co., who have large quantities of coal as well as ore to move for the balance of the year, have secured themselves as regards a part of the business of chartering outright two wooden tows, which they will operate for the rest of the season. It was announced, a few days ago, that they had secured from W. C. Richardson of Cleveland the steamer Outhwaite and consort Barr at $25,000, and now they have taken also the steamer A. A. Parker and consort B. W. Parker from Mr. A. A. Parker of Detroit. The price paid in this latter case is said to be $35,000. The two Parkers will carry about 4,500 tons per trip.

It is quite probable that for the present at least the tugs of both Toledo and Milwaukee will be left out of the Great Lakes Towing Co. A Milwaukee despatch says it is estimated that not over $1,000,000 in cash will be paid for the tug lines bought by the consolidated company and that this will be the basis for the issue of $5,000,000 of stock. Reports of this kind are unfair and misleading. The amount paid for the tugs is known only to the principals of the new company, but whatever it may be it should not be coupled with a $5,000,000 capital. No issue of stock has as yet been decided upon. It will not, in all probability, be much more than half of $5,000,000. The $5,000,000 is authorized capital and not the actual capital that is to be issued.

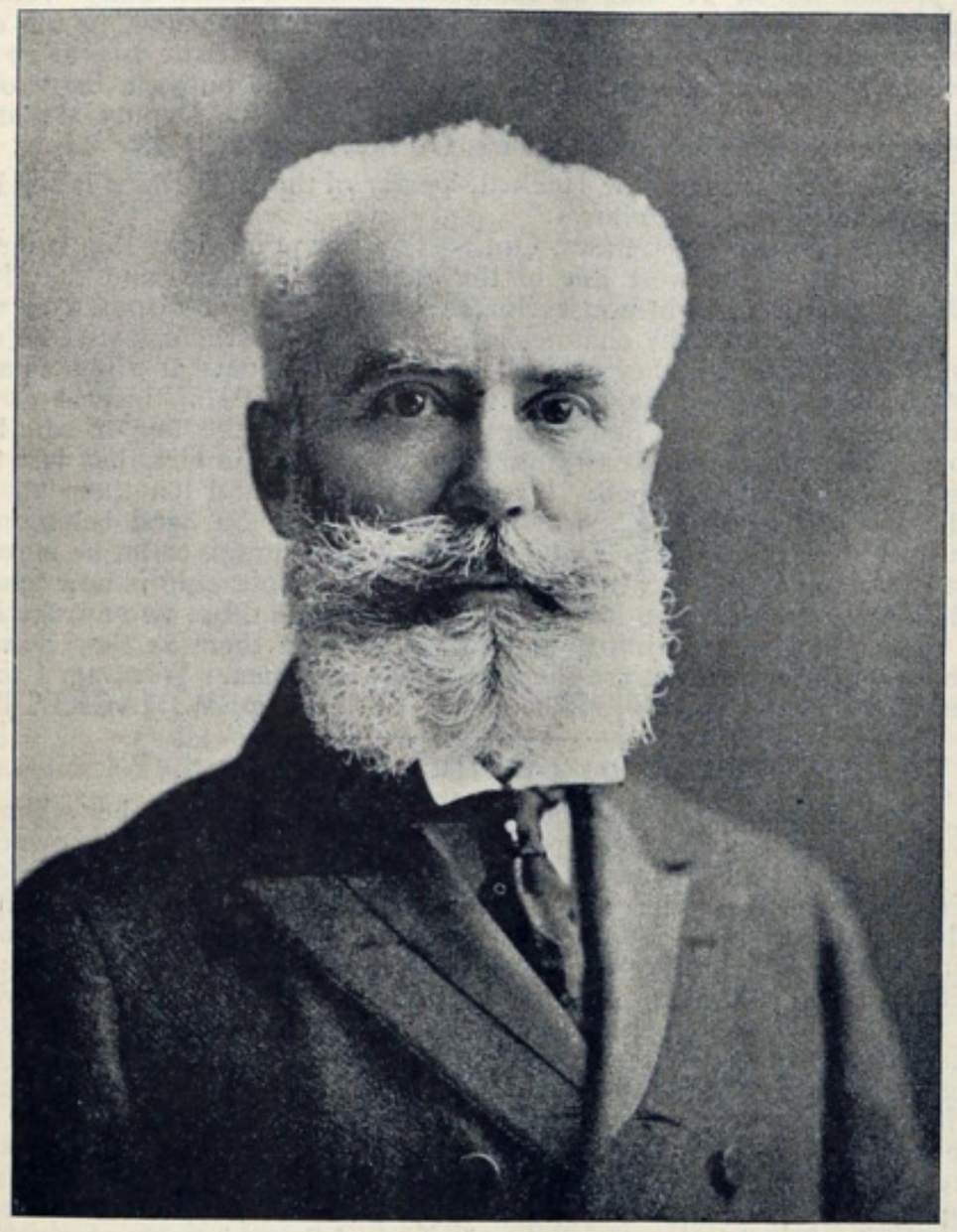
All danger as to further trouble on the ore receiving docks at Lake Erie ports for the present season seems to be at an end. During the early part of last week the situation was quite uncomfortable, as a general strike was feared, on account of the demand of the ore shovelers for an advance of 2½ cents a ton. A settlement was finally made, however, on an advance of 1½ cents, which brings the rate at Cleveland up to 12½ cents. The new rate is to apply to all kinds of ore and there is to be no extra charge for untrimmed cargoes. Vessels will not be called upon to make any extra payment for unloading on account of the advance. As both the dock companies and the representatives of the men went fully into all phases of the labor situation in fixing this advance, and there was a complete understanding between them, it is expected that there will be no deviation from this agreement.

Representatives of the Canada-Atlantic Transportation Co. seem to have made a serious mistake in not buying the Menominee steamers, which they have under charter, and which go to the National Steel Co. with the close of the present season. The ships are suited in every way to the Chicago-Parry Sound service of the Canada company and it would seem almost impossible to replace them for next season. In the negotiations, several weeks ago, with M. A. Hanna & Co. a price had been agreed upon for the five steamers, and it was undoubtedly 20 per cent lower than they could now be bought for, but the Canada company allowed the deal to fall through on a question of insurance for the balance of the season. They said they understood they were not to pay insurance for the balance of the season, while the owners of the vessels insisted, of course, that if the vessels were to be sold the insurance was to be paid by the purchasers from the date of sale, as much so as provision bills or any other items of operating expense would be paid by the new owners.

"On Saturday last I had an option," says John Craig, ship builder of Toledo, "on material for a steel vessel. Delivery was to begin in December, which is about the earliest that is to be had under any circumstances now. The option expired Saturday and on Monday the manufacturer was disposed to charge $3 a ton more for the steel." It is not possible now to secure material so as to admit of any more new vessels being turned out immediately upon the opening of navigation in 1900. Steel for a few vessels to come out about the middle of next season might be secured, but the price would probably be in the neighborhood of 2½ cents. It is said that the American Ship Building Co. has considered the matter of trying to secure some material from England, but it is not probable that relief could be had from that source, as the ship builders of Great Britain are as much crowded as the builders in this country, and our own manufacturers would be exporting a large part of their product if it were not for the unprecedented demand at home. Mr. A. B. Wolvin is understood to have been figuring on another steamer, but his negotiations are said to have also been suspended on account of unsatisfactory arrangements regarding delivery of material.

DEATH OF WM. H. GRATWICK, SR.

Wm. H. Gratwick, Sr., whose death was announced from Buffalo Tuesday, was a very large owner of vessel property on the great lakes. Almost since he undertook the establishment of a lumber business in Buffalo, late in the seventies, Mr. Gratwick has been interested in the upbuilding of a fleet of vessels with the Mitchell brothers, John and Alfred, of Cleveland. The first vessel they built was the wooden steamer W. H. Gratwick, now the J. C. Pringle, in 1880, and since that year they have built, including two steel steamers now under construction in Cleveland, a total of eighteen vessels, the actual aggregate cost of which has been $2,517,890. The list includes the first steamer named W. H. Gratwick and the barge R. L. Fryer in 1880; barge S. E. Marvin in 1882, steamer Ed.



Smith No. 1 in 1883 and another steamer W. H. Gratwick in 1887; then the steamer R. L. Fryer in 1888, steamer John Mitchell and barge J. C. Filmore in 1889, and a second steamer Ed. Smith, now known as Ed. Smith No. 2, in 1890. Following these were the steamer W. F. Sauber in 1891, steel steamer W. H. Gratwick in 1893, and steel steamers W. H. Gilbert, J. J. McWilliams and Lagonda in 1894, 1895 and 1896, respectively. Last year the Hendrick S. Holden, a steel steamer of the 6000-ton type, was added to the fleet, and this year's additions include the M. A. Hanna, already in commission, and the H. C. Frick to come out about a month hence, together with another 6000-tonner on the stocks at the Globe yard, Cleveland.

Mr. Gratwick's illness extended over almost three years. He was born in Albany, N. Y., and worked his way up from tally boy until he thoroughly understood every phase of the lumber business. He settled in Buffalo in 1877 and later established the Gratwick, Smith & Fryer Lumber Co. with a capital of $500,000. When this firm was dissolved two years ago Mr. Gratwick retired from business. The deceased is survived by a widow and two sons and one daughter, William H., Frederick C. and Mildred M.

SATISFACTORY PROGRESS ON NAVAL WORK.

A report from Rear-Admiral Hichborn of the bureau of construction and repair, navy department, for the month of July shows that satisfactory progress is being made with the construction of the various vessels building for the United States. The battleship Kearsarge, building at the Newport News yard would, it is stated, have had her trial next month but for the yellow fever scare which led to the departure of a large number of skilled mechanics. The vessel is within 6 per cent of completion. The Kearsarge's trial will take place in November and will be followed by that of her sister ship the Kentucky in December. Of the battleships of the Alabama class the Alabama is within 10 per cent of completion and the Illinois is 10 per cent behind her, while the Wisconsin is 10 per cent. behind the Illinois. The Maine is advanced 10 per cent and the Ohio 4 per cent, while work has just been commenced on the Missouri. The English builders of the cruiser Albany have notified the government that she will be delivered before the close of the year.

The United States revenue cutter service will establish at Curtis bay, near Baltimore, a station where all its vessels on the Atlantic coast may be laid up and overhauled without undergoing the expense of wharfage, which has been a considerable item to the department. An old ship, no longer fitted for service, will be used as quarters at Curtis bay, which by the way has a sufficient depth of water for the heaviest draught vessels of the service. The revenue cutter Seminole, which has been under construction at Baltimore, is nearly completed.

ENGINES WORKED THE WRONG WAY.

Engineers aboard ship have often worked their engines ahead when they thought they were backing them and have persisted in the operation, notwithstanding repeated signals to the contrary, just as a man at the wheel in time of excitement turns the wheel the wrong way. The second engineer of the steamer Onoko, of the Minch fleet of Cleveland, while working up the river at Ashtabula Harbor on Sunday last, turned his throttle the wrong way and the result is shown in the accompanying

picture. The new steamer Douglas Houghton of the Rockefeller fleet was tied up at the P. Y. & A. Ry. dock, just above the swing bridge. The Onoko came along through the draw and did not make the turn in the river on account of the trouble referred to in the engine room. On the contrary, she ran into the Houghton, and as she was loaded deep, the projecting stern of the Houghton swept everything clean above the main deck from stern to pilot house. The Houghton was not much damaged. The Onoko is undergoing repairs in Cleveland.

WAGES ON VESSELS OF THE GREAT LAKES.

A new schedule of wages, taking effect Aug. 15, was adopted by the executive committee of the Lake Carriers' Association at a meeting in Cleveland Tuesday. The advance applies to all but officers—captains, engineers and mates. There was a disposition on the part of some of the owners to advance the second mates but this was not done. Mr. Geo. Uhler, president of the Marine Engineers' Beneficial Association, was in Cleveland on the day of the meeting and it was understood that he requested an advance for the engineers, but the vessel owners said they had heard no complaint from the engineers themselves and they were of the opinion further that the increase in the wages of engineers granted last spring was based on the contract ore freights that still prevail with most of the ships. It is quite probable that further changes will be made in the card of wages before the season is at an end. The old and new schedules, with the exception of that applying to the third, or very small class of steamers, which is not now much used, are as follows:

WAGES PER MONTH ON STEAM VESSELS.

	First-class vessels: New Schedule.	First-class vessels: Old Schedule.	Second-class vessels: New Schedule.	Second-class vessels: Old Schedule
Chief engineers	$110 00	$110 00	$95 00	$95 00
Second engineers	75 00	75 00	70 00	70 00
First mates	80 00	80 00	70 00	70 00
Second Mates	55 00	55 00	45 00	45 00
Cooks	60 00	55 00	50 00	50 00
Helpers to cooks	22 00	20 00	18 70	17 00
Firemen	38 50	35 00	38 50	35 00
Wheelmen	38 50	35 00	38 50	35 00
Lookouts	38 50	35 00	38 50	35 00
Deck hands	22 00	20 00	22 00	20 00
Oilers	38 50	35 00	.....	.....

WAGES PER MONTH ON CONSORTS AND SAILING VESSELS.

	First class vessels: New Schedule.	First class vessels: Old Schedule.	Second-class vessels: New Schedule.	Second-class vessels: Old Schedule.
First mates	$50 00	$50 00	$35 to 45	$35 to 45
Second mates	40 00	40 00	.....	.....
Cooks	38 50	35 00	33	30
Seamen	38 50	35 00	28 to 33	25 to 30

Vessels lost during the month of June, according to reports completed by the Bureau Veritas, French shipping register, were as follows: Sailing vessels reported lost—5 American, 6 British, 2 Chilian, 1 Danish, 1 Dutch, 3 French, 2 German, 3 Italian, 10 Norwegian, 2 Russian; total, 35. (In this number are included 5 vessels reported missing.) Steamships reported lost—1 American, 7 British, 1 Danish, 3 German, 1 Italian, 2 Japanese, 1 Norwegian, 2 Spanish, 1 Swedish; total, 19. Causes of losses: Sailing vessels—Stranding, 13; collision, 4; fire, 1; foundered, 3; abandoned, 2; condemned, 7; missing, 5; total, 35. Steamships—Stranding, 9; collision, 3; fire, 2; foundered, 2; condemned, 3; total, 19.

STEEL MAST OF THE COLUMBIA.

The recent failure of the steel mast of the cup defender Columbia has been taken as a text for several animated debates between engineers. One authority has claimed that the Columbia's mast failed because it was of poor design, being built up of a number of pieces of sheet metal, riveted together, the argument being set forth that the riveted joint is in itself a source of weakness. It is asserted that at best not more than three-fourths of the strength of the plate is available. The engineers who take this view hold that to have produced a light and unbreakable steel mast it should have been made from an ingot of high carbon nickel steel, hollow forged on a mandrel and finally finished by turning in the lathe to proper contour. A mast of this construction, it is said, would have had no weak point and could have been made of uniform strength to the utmost exactness. If desired it might be treated by oil tempering, and under such circumstances would, it is asserted, have been twice as strong, weight for weight, as the riveted mast which gave way. The supporters of this plan admit that to have carried it out would have been costly but they contend that the results would have justified the expense.

But the Herreshoffs, evidently, cling to their original idea, for it is announced that the Columbia's mast is being repaired and will be ready for use in less than a week. The new plating will, however, be one-fortieth of an inch heavier than that at first put on. As the strain seemed to come in the middle of the mast, precautions are being taken to strengthen the spar at that point. Preparations are being made also to have a new steel mast for the Columbia ready to be stepped in time for the international races and probably in time for the trial races in September. This new mast, for which the steel is now being manufactured by a Pennsylvania concern, will be heavier than either of the steel spars made recently for the Columbia and Defender. Many pounds in weight will be saved by rigging the Columbia with a hollow steel yard for her clubtopsail. The new spar is 53 feet in length and has just been completed at Bristol. The saving, it is calculated, will be 250 pounds. The yacht is also to be made stiffer as the result of the showings made during recent trials. A consignment of sticks to be used as spare topmasts, bowsprits, clubs, yards and spinnaker booms have arrived at the Herreshoff plant. One of the topmasts is 60 feet in length and the other 15 feet shorter.

OIL BARGES ON THE PACIFIC.

The Bendixsen ship yard at Eureka, Cal., has under way the construction of a wooden barge of the half whaleback type with a deck of heavy crown construction for the transportation of oil on the Pacific coast. This barge, which is the first of a fleet of similar vessels, was designed by Capt. I. E. Thayer for the Union Oil Co. of California. The vessel now under construction is 180 feet in length, 30 feet beam and 18 feet from keel to deck crown, the lumber used throughout being the finest Oregon pine. The barge will have ten compartments and will have a capacity of 7,500 barrels or nearly 1,100 tons on 14 feet draught. When loading from storage tanks by the opening of a valve, the cargo will be placed on board in about five hours, while the vessel can be unloaded by means of steam pumps in about the same length of time. All modern improvements will be provided, including an electric lighting system, ventilating fans and a steam windlass. Anchors will be of the stockless pattern. The vessel will have four masts but of relatively small size. As the barge is fitted with a center keelson extending to the deck, the masts will not extend into the hold, but will step on deck, and rely entirely upon the rigging for support. Bilge keels will be fitted. Bulwarks will not be a part of the vessel and only a pipe rail will be used amidships, so that the whaleback lines will be more apparent than even in those vessels themselves. It is expected that the vessel will be completed by the latter part of September.

CRAMPS WILL NOT MOVE.

The Wm. Cramp & Sons Co. of Philadelphia has of late been made the subject of a great many newspaper canards. The last to make its appearance is especially ridiculous. The story emenated from New York and was to the effect that the Cramp company was constructing wharves and docks at Schenler's island, opposite Elizabeth, N. J. It was stated that the Philadelphia ship builders had purchased a part of the island and leased the remainder, amounting in all to forty acres, and that they would erect thereon a branch of their works. The report has been denied absolutely by officers of the Cramp company, most of whom are at a loss to imagine how it could have originated. One theory is that the report was started by speculators to boom land values, while Henry W. Cramp suggests that possibly the Crescent Ship Yard of Elizabethport, which is building launches and small boats for the Russian cruiser and battleship now under construction at the Cramp yard, may have landed material for these small boats on the island mentioned. Later investigations developed the fact that the improvements being made on the island are the work of the Seaboard Lumber Co., which will use the island as a site for lumber storage piles and a manufactory for boxes.

SHIP YARD APPLIANCES.

British ship builders are manifesting a tendency to bestir themselves in the matter of providing appliances for the handling of plates and other material, and particularly for placing machinery, boilers and heavy weights aboard vessels after they have been launched. One of the most progressive firms in this regard is William Doxford & Sons of Sunderland. The equipment of their yard in this respect consists primarily of gantry 600 feet in length and 15 feet in height. In the near future a 100 ton crane is to replace the sheer legs now in use. The elevation of the masting gib above high water mark will be about 120 feet and the crane can be worked at radii ranging from 30 to 50 feet, being able to lift 100 tons within that radii and 60 tons at 80 feet. At either end of the gantry mentioned there is a traveling crane capable of lifting 7 tons at a radius of 45 feet.

Structural work for the first of the ten buildings that are to be erected by the New York Ship Building Co. at Camden, N. J., has been completed at the Pottstown Bridge Works. The second building is well under way in the shop and will be completed in a short time.

BAR POINT STAKES.

As had been expected, the Canadian department of marine and fisheries makes objection to the constant removal by passing vessels of buoys marking the west side of Bar point, channel, Detroit river. The following letters explain themselves:

To the Editor of the Marine Review:—I beg to enclose herewith copy of a letter received by the chief engineer of this department from the light-keeper at Bois Blanc island, who is in charge of the buoys at the mouth of the Detroit river, pointing out the great difficulty in keeping the black buoys in their present positions, and I would ask you to appeal to the masters of vessels to assist this department in maintaining this service efficiently. These buoys are maintained chiefly for the benefit of the large-draught American vessels, but if the destruction continues as it has during the present season we shall be compelled to move them away from the edge of the channel, in the way suggested by Mr. Hackett, to the detriment of shipping. If vessels would steer for Bois Blanc island, as indicated in the sailing directions, this would give the buoys a berth of 400 feet.

F. GOURDEAU, Deputy Minister.

Department of Marine and Fisheries, Ottawa, Aug. 11, 1899.

The letter from Andrew Hackett, keeper of the Bois Blanc island light, referred to above, is as follows:

Colonel Anderson, Ottawa, Ont.:—The Bar point light-ship is moored 260 feet west of the west line of the channel. I understand the United States inspector of light-houses for this district is not disposed to move the light-ship nearer the channel line, as he thinks there would be more danger of collision, if they moved her out. The boats at night come up past the Detroit river light and steer for the light-ship instead of Bois Blanc island light, and that brings them right in the line of our black buoys. They have been carrying them away all summer, but last week was the worst we have had. I replaced them all and left them all right and now there are two gone and I have nothing on hand belonging to you to replace them with. I find there is water enough to let us move the first five black spars over in line with where the light-ship is now moored, and do away with the two lower ones altogether, as those two are the hardest to keep; it seems almost impossible to keep them as they now are. The heavy-draught boats are the ones that need them. What am I to do?

Bois Blanc Island, Aug. 9, 1899. ANDREW HACKETT.

CONVOY OF THE SHAMROCK.

The international yacht races off Sandy Hook next October will naturally bring into considerable prominence the steam yacht Erin, owned by Sir Thomas Lipton, owner of the cup challenger Shamrock. Indeed the Erin comes to this country as the convoy of the sailing yacht which will endeavor to win the America's cup. The Erin in first cost and refitting represents an expenditure of fully $400,000 on the part of her owner. The yacht is a year and a half old, having been built for Count Ignazio Florio by Scott & Co. of Greenock, Scotland. Later Sir Thomas Lipton purchased her from the Italian nobleman and changed the vessel's name from Aegusa to Erin. The Erin is 252 feet on the water line, 264 feet over all, 31 feet beam and 18½ feet depth. She is of 904 gross or 676 net tons. She has four watertight bulkheads and is fitted with triple expansion engines capable of driving her at a speed of 16 knots and to which steam is supplied from two boilers at a working pressure of 180 pounds. Just previous to the Spanish-American war the United States government made an effort to purchase the vessel with a view to converting her into a torpedo boat destroyer, but the project fell through. A feature of the Erin is her electric lighting plant. There are more than 3,000 incandescent lamps so arranged that the vessel can be illuminated along her rails, masts, shrouds and near the water line.

WIRELESS TELEGRAPHY FOR NAVAL USE.

A most remarkable demonstration of the practicability of the use of wireless telegraphy in connection with naval operations has just been made under the personal supervision of Marconi, the inventor, during the cruise of a British squadron. With the detached squadron was the Europa, which had been fitted in a hasty manner with the Marconi system. In the other portion of the fleet were the flagship Alexandria and the cruiser Juno. On the latter vessel Marconi had himself installed the wireless system. When communication was first established the Juno was more than 40 miles away from the Europa. Having received a message from the Europa relative to her consort the Juno turned and steamed toward the flagship and was enabled when more than 30 miles distant from that vessel to communicate to Sir Compton Domvile, the commander, the Europa's message. A second test was made and proved equally successful, and the whole trial is regarded in British naval circles as a veritable triumph for Marconi.

SALE OF SHIPS AND MACHINERY.

In an advertisement elsewhere in this issue, it is announced by Wm. R. Bates, United States marshal at Detroit, that the Steamer City of Rome will be sold at public action in that city Aug. 30. The sale is a result of differences between underwriters and owners of the steamer.

Mr. H. C. French of Buffalo, offers for sale a wooden package-freight steamer of 216 feet length and 32 feet beam.

E. G. Crosby & Co. of Muskegon, Mich., offer machinery from the wrecked steamers St. Lawrence and H. A. Tuttle, consisting of engines, boilers, steam steering engines, steam windlasses, etc.

A large marine vertical engine, 30 by 30 inches, non-condensing, is also offered for sale. Particulars of this engine may be had by addressing Box 7, Marine Review Pub. Co., Cleveland.

During a recent conversation with Congressman Foss of Illinois on the royal yacht Hohenzollern, the German emperor is quoted as saying: "It was formerly the strength of the German army which was the mainstay of European peace, but the future of the nations now lies on the ocean. Every power must be active and strong at sea in order to properly protect its interests. The increase in the German fleet in no sense involves a menace to any other nation, for the more powerful a nation is at sea, the longer will the others pause before beginning hostilities. The increase of the navies is therefore the best peace conference."

DIFFICULTIES IN FLOATING THE PARIS.

Additional details which are gradually being made public regarding the work of floating the American liner Paris, off the Manacles on the coast of Cornwall, serve to emphasize the difficulty of the undertaking which was successfully carried out by the Nordische Bergungs-Verein of Hamburg, after leading English firms had abandoned the task. The Paris went ashore May 21 and the three large wrecking boats of the German corporation did not make their appearance at the scene until June 7. Just thirty-three days were consumed in the patching, blasting and pumping necessary for the removal of the rocks which held the vessel. The German divers first made a survey of the vessel's bottom and found that great pinnacles of granite had penetrated her outer shell about midships, under the first and second boiler rooms and No. 5 hold. She rested as it were upon a great pivot. The work of the divers was seriously impeded by seaweed as thick as jungle grass and 10 feet high, and the removal of this was the first task undertaken. Later it was towed to a point where the tide caught it and carried it out.

The Germans early decided to abandon the idea of the English wreckers, which had been to lift the vessel off the rocks by means of pontoons and bags inflated with air and placed under the keel. Instead they adopted the plan of blasting away the teeth of granite which held the liner. Before this could be undertaken, however, it was necessary to do an immense amount of patching from the bow aft to the midship section, and the steamer's bow was lifted out of the water by adding weight to her stern and filling her after compartments with water. Only small blasts were used for fear of injuring the steamer, but in all more than 15,000 cubic feet of rock were removed, and it was, moreover, all done under water. As the boulders were torn up, hawsers were made fast to them by the divers and the wrecking steamers dragged them out of the way.

The greatest difficulty which the salvers experienced was when, after a month of work, they were finally ready to blast away the last pillar of granite which held the Paris. It was discovered that the pumps on the stranded steamer had lost suction and would not lower the water in her hold beyond 20 feet, whereas she had been filled flush to her depth of 50 feet in order to raise her bow. Thereupon it was necessary to resort to the especially powerful pumps of the Berthilde, one of the wrecking steamers. Holes were cut in the decks and sides of the Paris and the Berthilde lay alongside and sucked the water ballast out at the rate of 4,500 tons an hour. As the steamer righted, the weight of the water rushing aft tore out some of the compartments, and the engine rooms were inudated and the furnaces submerged. Portable pumps and boilers then had to be placed on board to work independently of the vessel's own power. Hardly had the Paris been righted and her engine rooms pumped out, when a gale sprang up which opened her seams and allowed her to again fill. To steady her during the storm and keep her from being driven farther on the rocks, anchors were carried out from the bow and stern and both sides and the chain of the anchors kept taut by steam winches on the vessel's deck. When the gale subsided, the Paris had to be pumped out again and some more patching done. The patches utilized were formed of shields of wood fitted over the breaks and padded around with canvas and rubber. Some of these shields were as large as the door of a house, but the actual holes in the Paris were not so large as might be imagined, the largest being only about 4 feet square. Plates had been strained and rivets started all along her bottom, however. The actual floating of the vessel was accomplished by setting in motion the steam winches connected with the chains of the stern anchors, while the three wrecking steamers united simultaneously in a long steady pull.

MACHINE TOOL COMBINATION.

The consolidation of concerns controlling practically all heavy machine tool trade of the United States, which has been the subject of discussion for some time past, has been perfected with the incorporation in New Jersey of the Niles-Bement-Pond Co. The new concern has a capital stock of $8,000,000, of which $3,000,000 is 6 per cent. cumulative preferred stock and $5,000,000 common stock. The companies embraced in the consolidation are the Niles Tool Works Co. of Hamilton, O.; the Pond Machine Tool Co. of Plainfield, N. J.; Bement, Miles & Co. of Philadelphia and the Philadelphia Engineering Works of Philadelphia. No bonds will be issued and the stock has all been subscribed, so that there will be no underwriting. No stock will be offered to the public, but stock will be listed in the course of a few months on the New York stock exchange. The financial scheme provides for an issue of $2,000,000 preferred and $5,000,000 of common stock. The balance, $1,000,000 preferred stock, will be kept in the treasury for the purpose of acquiring a balance of the stock of the Niles Tool Works Co., not yet in hand. The preferred stock may be redeemed at the option of the company in 1911 at 1.05. The new organization will employ between 3,000 and 4,000 men.

SHIP BUILDING ON THE PACIFIC COAST.

There is seemingly no let up in ship building activity on the Pacific coast. During the past half year the yard of H. D. Bendixsen at Humboldt has turned out two large craft for the firm of Hind, Rolph & Co. of San Francisco. The first was a four-masted barkentine, the William Carson, the second largest vessel of the entire fleet of 104 built at the Bendixsen yard since its establishment. This vessel has a lumber carrying capacity of 1,000,000 feet of pine. The other vessel was the four-masted schooner James Rolph, with a net tonnage of 517 and a carrying capacity of 750,000 feet of lumber. There remain on the ways at the Bendixsen yard to be launched this year a lumber schooner, a fair-sized steamer and an oil barge. The keel will also soon be laid for a steamer for Gray & Mitchell, which will be the largest vessel of her class yet built at the yard. Mr. Hitchings of Hoquiam, Wash., recently closed a contract to build another schooner for Pollard & Dodge of San Francisco. She will be 210 feet long, 38 feet beam and 14 depth of hold, and will cost $90,000. R. Hueston of Everett, Wash., has launched the tug Independent, building for Capt. Sprague.

ITEMS OF INTEREST.

Representatives of the disaffected political parties of San Domingo are understood to be in this country looking for vessels to engage in filibustering service.

The torpedo boats Fox and Farragut, built on the Pacific coast and both of which exceeded contract speed on their official trials, have been accepted by the navy department.

Plans have been completed for the opening of the Clyde line service from Providence, R. I., on September 1. Vessels will be run to Charleston, S. C., Brunswick, Ga., and Jacksonville, Fla.

The United States training ship Alliance has left Plymouth, England, on her regular cruise It is expected that she will reach Gibralter in time to meet the Olympia, and she will thus be the first American vessel to greet Admiral Dewey.

Improvements recently undertaken by the Midvale Steel Co., Philadelphia, will entail expenditure of about $30,000. They will include additions to the machine, stove and casting buildings, and the enlargement of several smaller structures.

The steamer Kaiser Friedrich, recently rejected by the North German Lloyd Co., is now in dock at Hamburg undergoing extensive alterations. Among other changes a four-bladed propeller is to be substituted for the three-bladed screw now fitted on her port side.

The Harlan & Hollingsworth Co., Wilmington, Del., has contracted to construct for the Southwark Foundry & Machine Works of Philadelphia five large cylinders for Corliss engines. The cylinders will each measure 78 by 60 inches and will weigh 40,000 pounds each.

The Reliance Machine & Tool Co. of Cleveland has sold a consignment of bolt cutters to the American Ship Building Co. for use in its yard at Lorain, O. A consignment of bolt cutters was also sold recently to L. P. & J. A. Smith, dredging contractors of Cleveland.

The trial trip of Mr. P. A. B. Widener's new steam yacht Josephine, which was originally set for August 9, was postponed until the 12th in order that some minor changes might be made. The vessel was but recently completed by the Neafie & Levy Ship & Engine Building Co. of Philadelphia.

An additional argument in favor of stone dry docks would seem to be found in the fact that repairs now in progress on the League island dry dock have disclosed the fact that although the dock was built but eight years ago the southern yellow pine in the portion above low tide is very much decayed.

Postponement of the launching of the United States torpedo boat Bailey, building at the works of the Gas Engine & Power Co. and Seabury & Co., Consolidated, Morris Heights, New York City, is announced, owing to a strike of boiler makers and machinists. There is now no telling when the vessel will be launched.

An order has been issued by the navy department for the overhauling of the yachts Wasp, Frolic and Dorothea at the Norfolk navy yard. It is understood that they will join the converted yacht Eagle in survey and coast work, thus relieving vessels of much larger size which have heretofore had to be assigned to this work.

The annual report of the Mississippi River commission shows that there was expended on the river during the year ending June 30, 1899, $1,075,000, while the allotments made for 1900 amount to $1,250,000. During the past year the United States built 7,686,758 cubic yards of levees, while state and local authorities constructed 3,136,541 yards.

During the recent severe gale at St. Michael's island, Alaska, thirty river steamers were thrown upon the beach of the island and twenty-five are wrecked beyond repair, the damage entailed amounting to fully $500,000. Some vessels, which cost as high as $20,000 when built, are offered for sale for $2,000 and other wrecks are offered as low as $100.

American machine tool manufacturers continue to capture good orders in the foreign markets. The Bullard Machine Tool Co. of Bridgeport, Conn., will within a few days ship a large machine to Tokio, Japan, and the Pratt & Whitney Co. of Hartford, Conn., will export to Antwerp in the near future nine cases of machine tools, including cutting-off lathes.

An interesting test is to be made off Halifax between two British torpedo craft—the Quail, a 30-knot destroyer, and torpedo boat No. 61. which is rated at 22 knots. The torpedo boat will be given 30 minutes start, and it is proposed to make a 100 mile run with a view to determining the relative merits of the classes of vessels represented. Both vessels are being overhauled at Halifax dock yard preparatory to the trial.

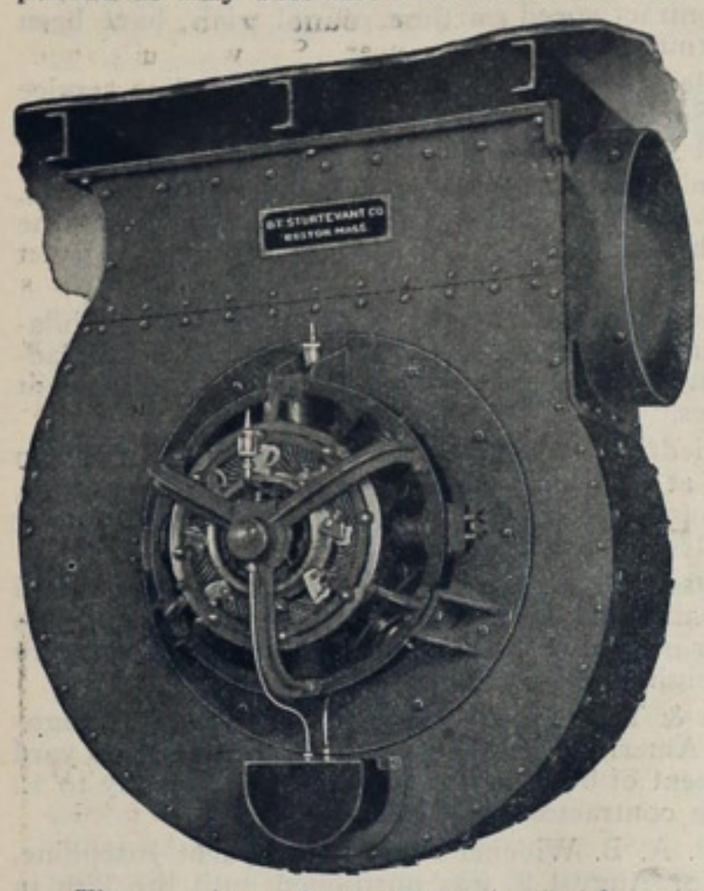
Some dissatisfaction has been caused by rules recently adopted for the Sailors' Snug Harbor on Staten island. One of the new regulations makes ineligible a mariner who has left the sea for as long a period as nve years to engage in some other calling. Capt. R. R. Randall, who founded the Harbor, provided in his will that it was to provide shelter for "aged, decrepit and worn-out" seamen who sailed under the American flag.

Acting upon the suggestion of Admiral Dewey, the navy department has issued orders instructing Rear Admiral Watson to send at his own discretion the several vessels in the Pacific squadron in rotation to Yokohama or some other port far north of Manila, the stay of each vessel in northern waters to be determined by the needs of the service in the Philippines. The step is taken in behalf of officers and men of the fleet, many of whom are suffering from the effects of a protracted stay in the tropics.

A prize of $30,000 for life saving devices for use in disasters at sea has been offered by the family of the late Anthony Pollok, who, with his wife, perished in the Burgogne disaster. Information regarding the offer has been transmitted to the state department at Washington by Charles J. Bell, trustee and manager of the Pollok estate. According to the provisions of the offer, $20,000 is to be paid for the production of an invention answering the requirements outlined, and the remaining $10,000 will be utilized in extending the information obtained through the competition.

SUSPENDED FAN FOR USE ON SHIPBOARD.

One of the prime advantages of an electric fan is its adaptability. Not only may it be located where most convenient for the adjusting of piping, but it may readily be constructed in such form as to be supported or suspended as may best suit the conditions. The accompanying illustration serves to make clear this point, for it represents an entirely new design, built upon a special order by the B. F. Sturtevant Co. of Boston, Mass. The fan as here shown was designed for use on shipboard, and is suspended from the deck. In general form the fan itself is of the usual steel-plate construction, being an exhauster with the inlet on the side farthest from the motor. The motor is of entirely special construction, having eight poles, rendering it very compact, so that it extends the minimum distance from the side of the fan. In the size here shown the field ring was of wrought iron, although in larger sizes it is built of cast steel or cast iron.



The cast iron plate with projecting lugs, which is attached to the fan side, serves to center and hold in position the field ring of the motor, while tripod hangers extending from either side of this ring support the armature shaft in ring oiler boxes. The field cores are of wrought iron, giving the highest efficiency to the field, and the pole shoes are of cast iron of such peculiar shape and size as to render the machine capable of extreme variation of load without sparking at brushes, and without any shifting or adjustment whatever. The field coils are machine-wound, and thoroughly insulated, their form being thoroughly open. The windings present a maximum amount of radiating surface, which results in the most perfect ventilation, and prohibits any great amount of heat. The armature cores are built up of laminated, slotted discs, mounted on a cast iron spider, having a hub projection for the reception of the commutator. These core discs are solidly clamped between two brass rings which have corresponding core teeth. The armature is of the core-wound drum type, and in the usual form has a two-circuit winding, although in some cases multiple winding is used. This type of winding on machines of low speed and small output is of great advantage. The commutator is of large diameter, and consists of pure rolled or drop-forged copper segments, supported in a cast iron shell of spider construction, and thoroughly insulated. Reaction brushes of fiber graphite are used, and supported by special rigging. These motors require no shifting of brushes from no load to full load, thereby greatly reducing the attention required. Evidently fans of this type can be constructed in various sizes and forms. Motors can be provided having capacities ranging from three to 125 H. P.

LONG-STROKE RIVETING HAMMER.

One of the officers of the Chicago Pneumatic Tool Co. says of the Boyer long-stroke riveting hammer, recently introduced among the other pneumatic specialties of that company: "These hammers are used in driving ⅞-inch and 1-inch rivets and have a minimum of vibration with a maximum of power. They are found to do most excellent work on all kinds of riveting. Among other places where they have been very successfully used is at the boiler shop of John Mohr & Son, Chicago. On one boiler one man with this hammer did the same amount of riveting in a day that it has before taken three men two and a half days to perform, and the boiler was tested to 400 pounds pressure without any leaks appearing. The work was pronounced superior in every way, and the result has been a demand so great that we are unable to supply the hammers as rapidly as they are wanted. While these tools are entirely new, they have been used sufficiently to demonstrate that they are far in advance of any pneumatic hammers as yet brought out, and will prove invaluable in all classes of work where yoke riveters can not be used."

In a report recently received at the navy department, Naval Constructor Richmond Pearson Hobson states that the three recovered Spanish war vessels, upon which repairs have been completed at Hong Kong, will be worth to the government fully $610,000, and he adds that he contemplates making an effort to raise three more Spanish vessels now at the bottom of Manila bay. Hobson also emphasizes the necessity for a large dock yard in the orient.

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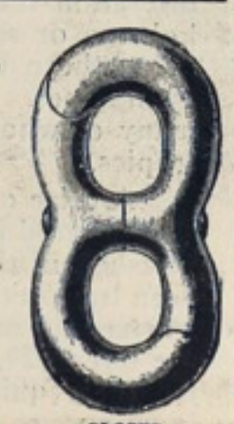
CLOSED.

SHIP YARD HAPPENINGS.

The Monongahela & Ohio River Transportation Co. of Pittsburg, Pa., of which Francis J. Torrance is president and John M. Boyd general manager, has awarded the contract for building an excursion steamer for the Pittsburg trade to M. G. Knox & Son of Marietta, O. The boat will be a side-wheeler and it is claimed will be one of the finest craft on the rivers. She will cost $50,000 and will be 210 feet long, 56 feet beam and 6 feet depth of hold, and will have three decks. The capacity will be 2,000 passengers. All modern improvements will be provided. The electric lighting system will embrace 500 incandescent lamps, eighteen arcs and one 6,000-candle-power search light.

A recent launch at the Roach ship yard, Chester, Pa., was that of the steam yacht Alberta, building for A. E. Tower of Poughkeepsie, N. Y. She is 158 feet on load water line, 186 feet over all, 22 feet beam and 12 feet depth, and is fitted with four-cylinder triple expansion engines of 12½, 20, 22½ and 22½ inches cylinder diameters and 18 inches stroke. Steam will be supplied from four Almy water tube boilers.

The Quebec, Hamilton & Fort William Navigation Co. of Hamilton, Ont., has been incorporated with a capital of $1,000,000. The incorporators are A. T. Wood, M. P., William Southam, C. E. Doolittle, C. Wilcox, William D. Long and A. B. McKay of Hamilton.

The Brooklyn Lighterage Co. of Portland, Me., recently incorporated, with a capital stock of $100,000, organized for the purpose of building and managing vessels. Officers are: President, John T. Sholfield of Portland; treasurer, George L. Sholfield of Brunswick, Me.

It is claimed that A. E. Knopff of New York, whose steam yacht Moltoni was recently burned at Kingston, Ont., will build a new vessel for service on Lake Erie.

Capt. E. W. Van C. Lucas, United States engineer at Wilmington, N. C., has asked for bids for the provision of a steam inspection boat.

A rumor is in circulation to the effect that the Standard Oil Co. is considering the matter of building another tank steamer.

DECLINE OF ERIE CANAL TRAFFIC.

Erie canal boatmen continue to take a gloomy view of the traffic situation, and it must be admitted that their despondency is not without cause, in view of the fact that although receipts of grain at New York from Buffalo have, thus far this season, been much larger than last, the grain trade of the Erie canal had fallen off considerably compared with either of the two preceding seasons. The railroads on the other hand show heavy gains over both the same periods of 1898 and 1897. The canal boatmen had hoped that the showing this year would at least equal last in view of the large business that is otherwise offered to the railroads. The figures of the New York Produce Exchange showing the total receipts via canal and rail at the port of New York for the past three seasons are as follows:

TOTAL RECEIPTS OF GRAIN AT NEW YORK, MAY 1 TO AUGUST 1, 1897, '98 AND '99.

	Canal.	Rail	Total.
1897, bushels	8,008,700	33,557,394	41,566,094
1898, "	7,224,900	35,945,043	43,169,943
1899, "	6,808,800	40,210,125	47,018,925

The falling off in the canal traffic is explained in some considerable degree by the fact that the strike of grain shovelers at Buffalo cut out the canal altogether, while some grain was moved all rail, and from the fact also that the disturbed condition of canal improvements has been as much of a draw-back this year as it was in 1898.

The steam yacht Alberta, recently completed at the Roach ship yard, Chester, Pa., made a most remarkable speed trial a few days since. In a one-hour run she logged 23 miles, a record which it is claimed has not been equaled by any other American steam yacht. Moreover it was the Alberta's first trial and she will doubtless improve upon the record later.

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TRADE NOTES.

A most artistically prepared book has been issued by Messrs. Westinghouse, Church, Kerr & Co., New York, entitled "Light and Power Installations for Private Residences and Hotels." As a work of art, we have not heretofore seen its equal. The finest tinted paper, profuse and original illustrations, and a choice blending of colors, combine to present a business publication in a luxurious setting, coupled with the most refined good taste. The pages are illustrated with artistic views of private residences and hotels where electric lighting is provided by Westinghouse gas engines and generators. The Westinghouse gas engine is a novel invention, specially adapted for electric lighting. Gasoline can be used as fuel when gas is not available. With an electric plant, light is supplied for the house, stables, and grounds; and also power for operating pumps, elevator service, ventilating fans, lathes, saws, preparing fodder, ice freezers, dairy, laundry, and other work connected with private residences and hotels.

A special catalogue, No. 8, just issued by the Chicago Pneumatic Tool Co., Monadnock block, Chicago, illustrates and describes the elaborate exhibit of that company at the Master Car Builders' and Master Mechanics' conventions at old Point Comfort in June last. The catalogue contains a number of entirely new tools and appliances of the pneumatic kind that have not heretofore been shown. The list includes Boyer long-stroke hammers and riveters, new Boyer pneumatic hammers, Boyer piston air drills, Whitelaw reversible drills, Whitelaw reversible wood boring machines, Boyer yoke riveters and riveting hammers, cylinder and air motor chain hoists, pneumatic painting machines, automatic couplings, air compressors, Haeseler piston drills, Phoenix rotary drills, piston and rotary breast drills, Henrikson flue cutters, flue welders and reducers, Cramp pneumatic rammers, stay bolt nippers, pneumatic car jacks, rivet forges, etc.

The twin-screw steamer Fulton Market, which is so well known in New York harbor, has triple expansion engines built by John W. Sullivan and Roberts boilers of about 700 horse power. She was built about five years ago and, during that whole period, she has never experienced an hour's delay which could be traced to the boilers. No repairs to the boilers have ever been necessary.

A pamphlet just issued by Henry R. Worthington, New York, dealing with some recent installations of condensing apparatus by that great pump concern, contains an excellent picture of the steamer Havanna of the Ward line, one of the largest merchant vessels of the United States, 6,600 tons register. This steamer and a sistership, the Mexico, are completely equipped with Worthington air, feed, bilge fire and sanitary pumps. There is also presented a picture of the Pennsylvania Co.'s ferry boat Pittsburg, running between Jersey City and New York, and which, with the Philadelphia of the same line, is also equipped with Worthington pumps.

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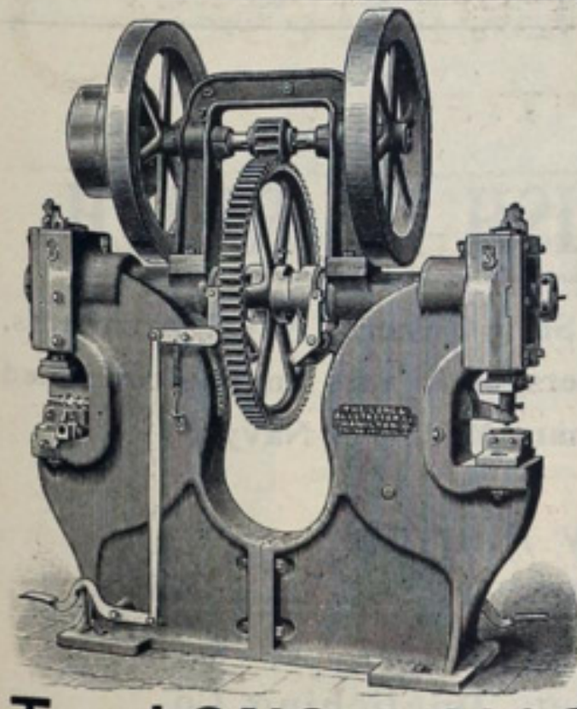

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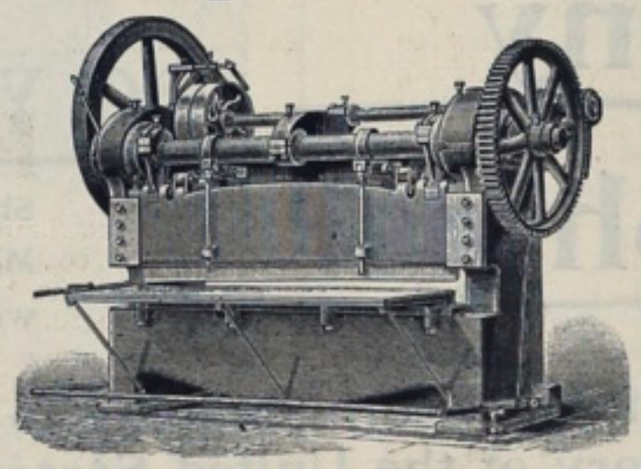

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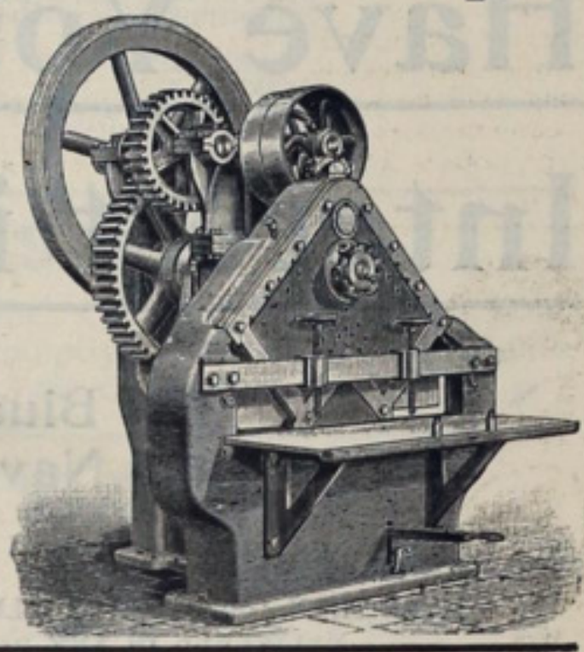

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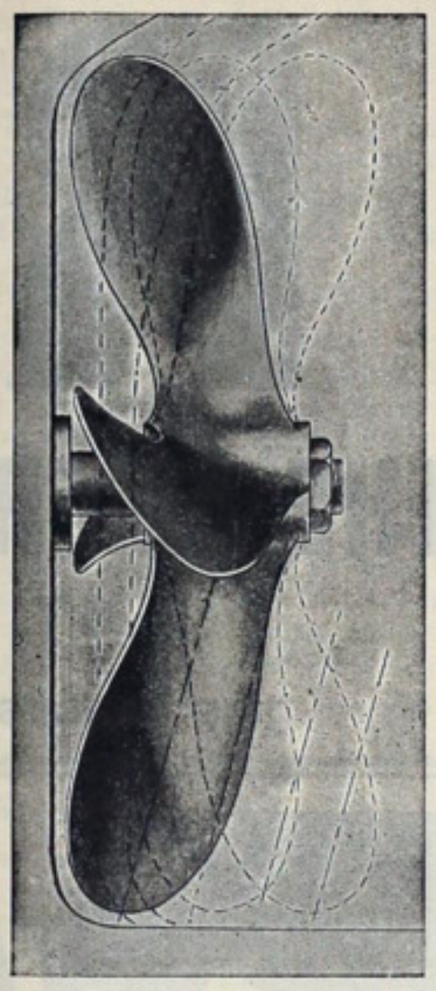

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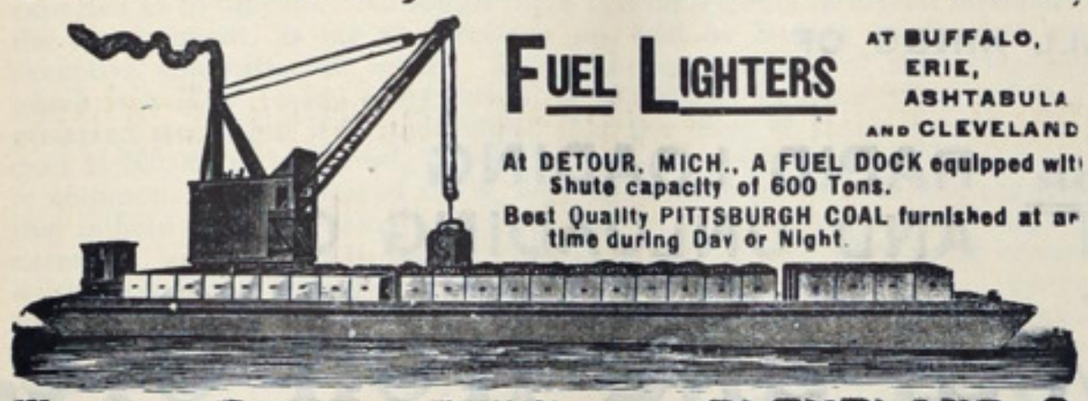

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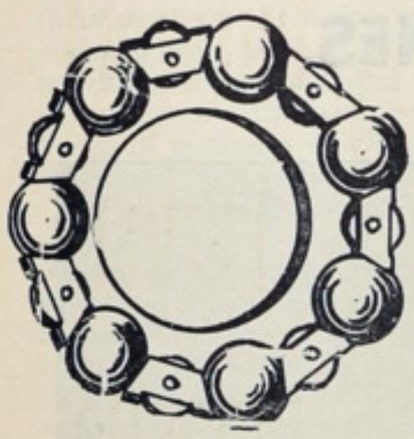

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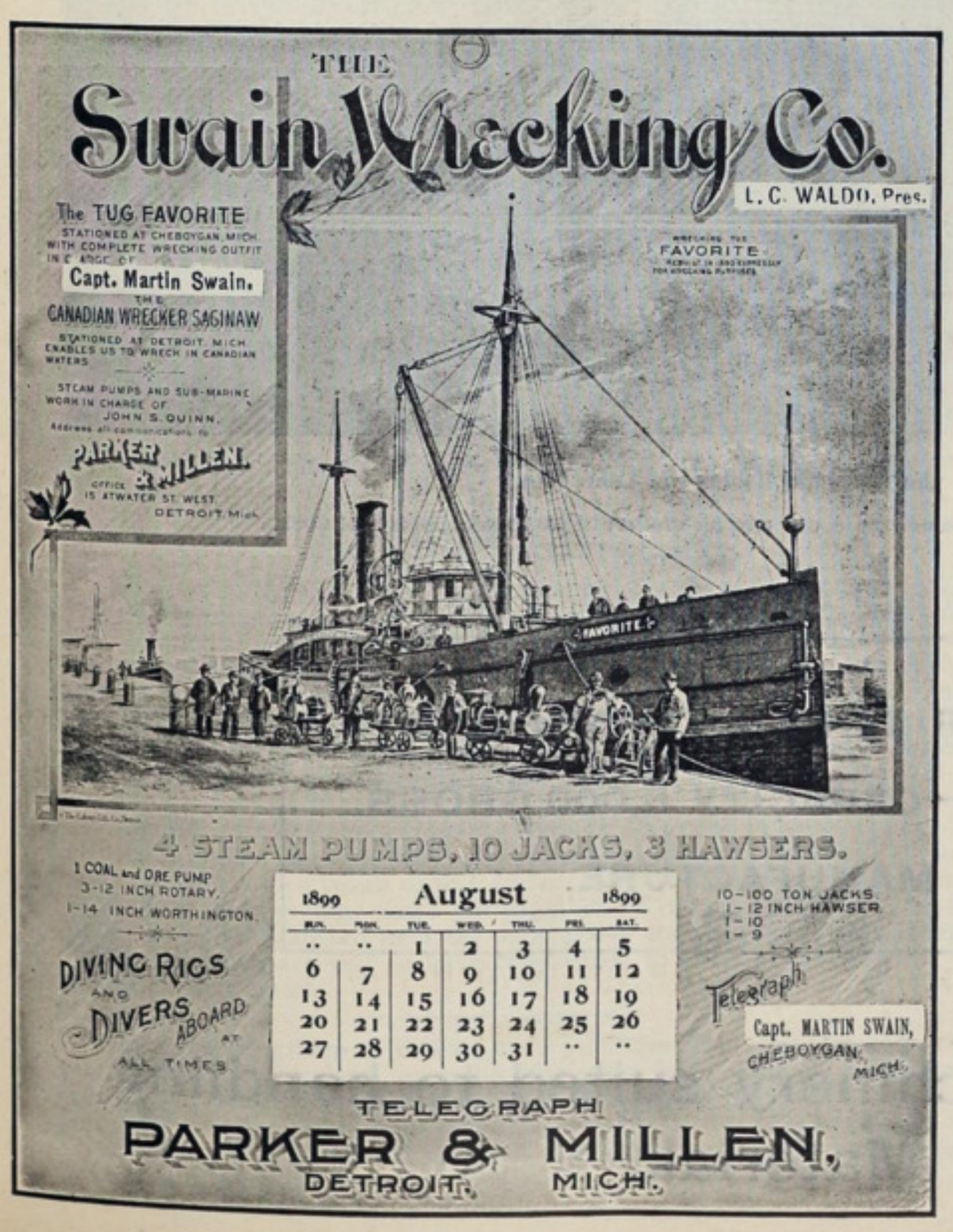
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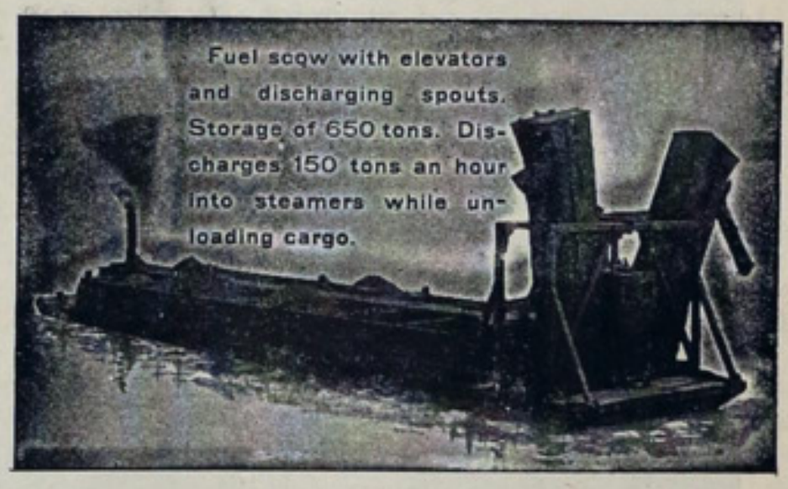
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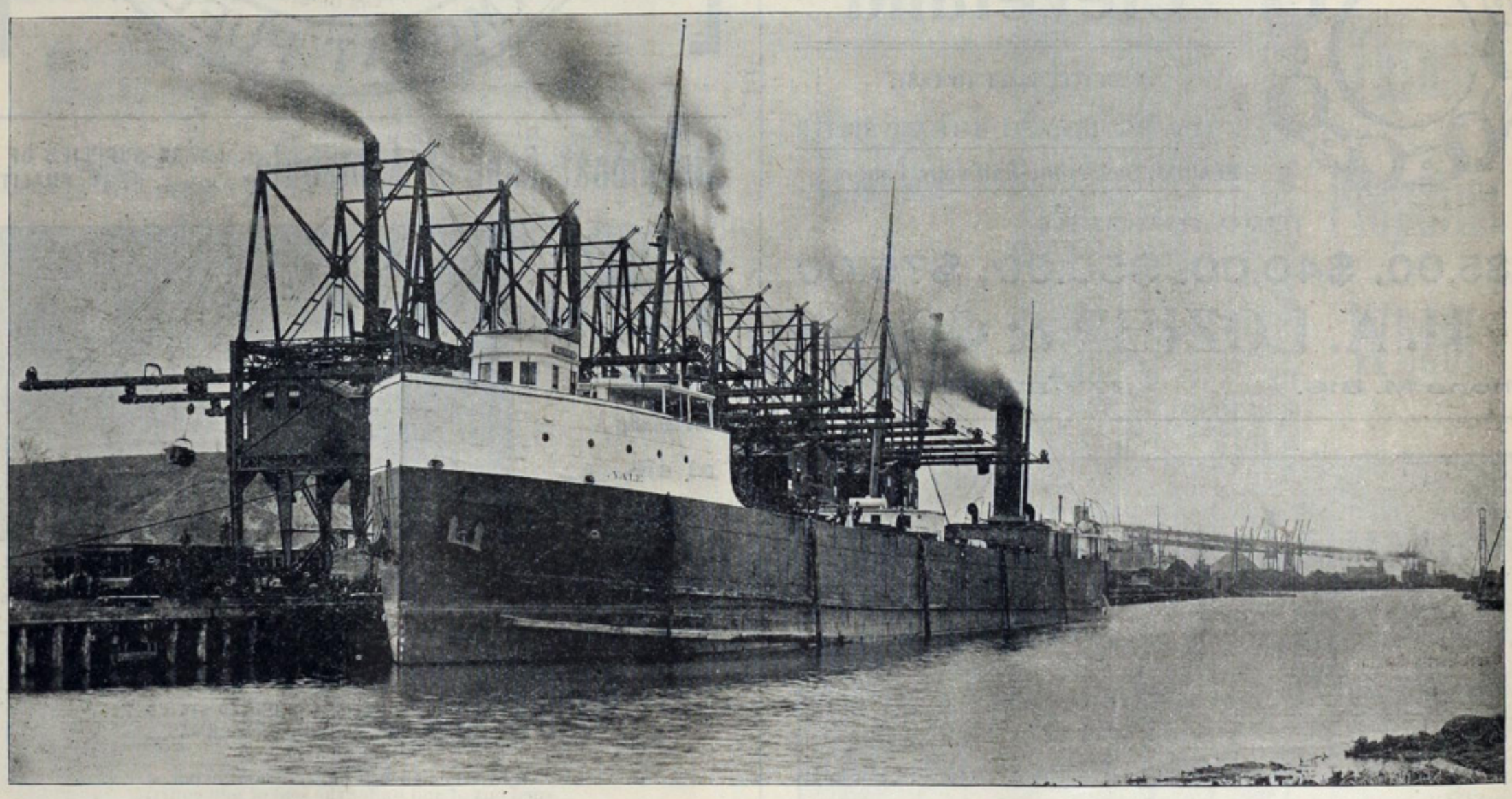

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